REPORT OF THE AD-HOC COMMITTEE

ON

EXPORT OF MINOR FOREST PRODUCTS

MINISTRY OF FOOD, AGRICULTURE, COMMUNITY DEVELOPMENT AND COOPERATION,
(DEPARTMENT OF AGRICULTURE)
GOVERNMENT OF INDIA
NEW DELHI.

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PREFACE

This Committee was set up by Government of India in the Ministry of Food, Agriculture, Community Development and Cooperation on the recommendation of the Estimates Committee in their 48th Report. The Committee was to estimate the availability of minor forest products which had an export market or potential, suggest long-term policies with respect to the export of these products, recommend steps for increasing the availability of these products and suggest specific schemes with expenditure estimates for the development of these products.

After considerable correspondence with the State Forest Departments, Agricultural Marketing Organisation, Ministry of Commerce, Indian Standards Institution, National Chemical Laboratories and other public and private bodies and individuals, we were able to collect some data which, though inadequate for the study proposed to be done by the Committee, is the basis of this Report. It has not been possible to suggest any specific schemes with estimates of expenditure involved for the development of minor forest products with an export potential as there was insufficient data for this purpose both with respect to the production of these products as well as the markets for them.

The Committee held four meetings, the last of which was on 17th January, 1967. Most of the members attended these meetings.

To all the members of the Committee I express my gratitude for their cooperation in the preparation of this report. In particular I would like to thank on behalf of the Committee and myself Dr. Sadgopal, Deputy Director, Indian Standards Institution, who so willingly gave the Committee the benefit of his experience and wide knowledge on the chemistry and marketing of various products dealt with in the report.

The preparation of the report was an added burden to the Export Promotion Division of the Ministry of Food, Agriculture, Community Development and Cooperation. They willingly undertook this burden and thereby made the task easier.

Hari Singh
Inspector General of Forests

NEW DELHI
DECEMBER 22,1967

CHAPTER I

INTRODUCTION.

Minor forest products consist of a large number of forest products which are of economic value both for indigenous consumption as well as for export. The word "minor" (forest products) is really a misnomer in that these products are in some States a major source of revenue. It is used chiefly to distinguish these products from the major products which are wood and timber. The importance of these minor forest products is indicated by their export value which in 1965-66 was worth Rs. 12 crores in foreign exchange. In comparison to this, the export of the major forest products was only Rs. 3.5 crores.

2. Realising the importance of the export trade in these products, Government of India, on the recommendation of the Estimates Committee in their 48th Report, decided to set up an Ad Hoc Committee to go into the problems connected with the export of some of the important forest products so that concerted measures could be taken to increase their exports. A copy of the Government Resolution is at Appendix I. The Committee had to collect a considerable amount of information, little of which was readily available. The State Forest Departments also did not have the requisite basic data and it is necessary that data on the production of important minor forest products should be collected by them as early as possible so that a detailed scheme could be made out for the development of the important minor forest products in the country.

3. One of the major handicaps in the development of these minor forest products is the lack of data on foreign markets for them. Some of these products are not well known in foreign markets and it is necessary that they be well advertised to create such markets. Another handicap has been the adulteration of these products in the market with the result that foreign buyers have no use for them. The Agricultural Marketing Directorate should, therefore, draw up marketing standards for each of these products to ensure that only quality products are exported. Similarly, the Indian Standards Institution should also prepare standards for these products so that only standard products are exported.

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APPENDIX I

No. 14-15/64-EP
GOVERNMENT OF INDIA
MINISTRY OF FOOD AND AGRICULTURE
(Department of Agriculture)

NEW DELHI, THE 28TH NOVEMBER, 1964

(TO BE PUBLISHED IN THE GAZETTE OF INDIA, PART I, SECTION I)

R E S O L U T I O N

On the recommendation made by the Estimates Committee in their 48th Report, the Government of India have decided to set up an Ad Hoc Committee with the following composition to go into the problems connected with the export of forest products with special reference to Myrobalans, Walnuts and Mushrooms so that concerted measures may be taken to increase their exports:-

1. Shri Hari Singh, Inspector General of Forests, Ministry of Food & Agriculture. — Chairman
2. Shri R.T. Mirchandani, Agricultural Marketing Adviser to the Government of India. — Member
3. Director of Agriculture, Himachal Pradesh Government. — "
4. Chief Conservator of Forests, Jammu & Kashmir. — "
5. Director of Agriculture, Jammu & Kashmir. — "
6. Shri P.C. Gera, Deputy Secretary, Min. of Food & Agri. (Deptt: of Agriculture), — " (Since replaced by Shri J.S. Sarma, Jt. Commissioner (PC))
7. Shri K. Srinivasan, Deputy Secretary, Ministry of Commerce. — " (Since replaced by Smt. S.L. Singla, Dy. Secy.)
8. Shri J.S. Mathuru, Development Officer, Dte. Genl of Technical Development, Ministry of Industry and Supply. — "
9. Shri S.L. Katyal, Assistant Agrl. Commissioner, I.C.A.R. — Member-Secretary (Replaced by Shri A. Oswald Asstt: I.G. Forests, Deptt: of Agri. w.e.f. 28.3.1967)

The Ad Hoc Committee may co-opt or invite to its meetings such other persons as could render useful assistance in its work.

The terms of reference of the Ad Hoc Committee will be as under:-

i) to establish on the basis of available material the availability of forest products with special reference to myrobalans, walnuts and mushrooms;

ii) to consider and suggest long term policies for the export of forest products, specially, myrobalans, walnuts and mushrooms;

iii) to recommend steps to be taken for increasing the availability of forest products with special reference to myrobalans, walnuts and mushrooms for export purposes; and

iv) to suggest specific schemes, with estimates of expenditure involved, for developing various forest products with an export potential.

The Ad Hoc Committee will correspond directly with the State Governments/Union Territories/Central Ministries/Departments for obtaining such information/documents as may be necessary for its work and for arranging its tour programmes. It may also directly contact, if necessary, the representatives of other organisations interested either in the production or in the exports of forest products.

Sd/- G.R. Kamat
Secretary to the Govt. of India.

No.14-15/64-EP New Delhi, the 28th November, 1964.

ORDER: Ordered that a copy of the Resolution be communicated to all the State Governments/Union Territories, Ministries of the Government of India.

Ordered that the Resolution be published in the Gazette of India for general information.

Sd/- G.R. Kamat
Secretary to the Govt. of India.

CHAPTER II

DEVELOPMENT OF MINOR FOREST PRODUCTS

There are over 3,000 minor forest products in India which meet the day to day requirements of the people. These include medicinal plants, edible wild plants, resins, oils, gums, fats, essential oils, tans, dyes, bamboos, canes, fibres, flosses, grasses, bidi leaves for wrapping and packing and animal products like lac, ivory, horns, bones and honey. Some of these raw materials are of great economic value, feed modern industries and figure prominently in international trade.

2. Among the minor forest products which are being exported the more important ones are lac, myrobalans, gums including gum karaya, sandalwood oil and bidi leaves. The export value of these items alone in 1962-63 was Rs. 791 lakhs, out of a total export value of all merchandise of Rs.68,600 lakhs, i.e., over one per cent.

Product	Export value (1962-63) Rs.
Gum Karaya (excluding other gums)	153.36 lakhs
Myrobalans	49.14 "
Lac (of all kinds)	352.95 "
Sandalwood oil	128.54 "
Bidi leaves	104.68 "

3. While reliable data on the annual production, internal consumption and carry over from year to year are not available, it is estimated that the annual internal consumption of minor forest products is well over Rs. 100,00 lakhs (100 crores) and the Forest Departments obtain an annual revenue of over Rs.1200 lakhs from these products. Despite this, there has been no organised attempts to exploit the resources of minor forest products and large quantities of such products are allowed to rot in the forests. Where collection is done, it is done in un-organised manner by tribals or petty contractors.

4. One of the difficulties being experienced in exporting minor forest products is the lack of any quality standards because of lack of proper collection methods. Collection is usually done by tribals who supplement their livelihood with the money they obtain from the sale of the products they collect in the forests. The produce is bought by petty contractors and no standards are adhered to with the result that its quality is generally very poor and unacceptable in the foreign markets. Another difficulty is that of fluctuating market prices as in the case of lac. The States are, therefore, averse to investing large sums of money in a product which has

an uncertain future in the market.

5. In the Fourth Plan it is proposed to increase the production of these minor forest products for which there is a substantial market, particularly those which are of export value, such as gum karaya, myrobalans, kanak, lac, sandalwood and bidi leaves. If these products are exploited scientifically with a view to obtaining the maximum sustained yield, it should be possible to double the present export potential by the end of the Fourth Plan.

6. During the Fourth Plan, a scheme 'Investigation on foreign exchange earning minor forest products' has been sanctioned at Forest Research Institute & Colleges, Dehra Dun. Economic researches are being conducted under the scheme in some of the more important minor forest products with a view to assess distribution, availability, methods of collection and exploitation, extent of trade, scope of demand, adulteration, grading, marketing etc. This would help in suggesting improved methods of their utilisation and supplying raw materials of standard quality to the trade and industry of the country and will also increase the production for export of all such minor forest products mentioned earlier. The scientific exploitation of important minor forest products like gum karaya, myrobalans, lac, sandalwood, bidi leaves etc. would ensure maximum sustained supplies and increased export potential.

7. State Forest Departments also have schemes sanctioned under IV Plan regarding survey of minor forest products and cultivation of medicinal and essential oil plants. The plantations when raised would be additional sources of minor forest products and help earn more foreign exchange.

Plantations of medicinal plants and other species which are a source of minor forest products would be raised under this scheme.

Raising of bamboo plantations has been included in the Centrally sponsored scheme of Fast Growing Species.

Outlay provided for Fourth Plan for Minor Forest Products excluding bamboo is Rs.540 lakhs.

8. This programme of development of minor products has substantial labour employment potential since the collection of bidi leaves, lac, myrobalans etc. is done by manual labour and particularly by tribals. Attempts are being made by the States to develop forest labour cooperative societies for the collection of some of the products. In Madhya Pradesh a State Tribal Cooperative Development Corporation has been formed recently. Minor forest products form the main item

of business of the Corporation which buys the produce collected by the tribals. The Corporation also undertakes processing and sale of the products thereby ensuring both quality and a fair return to the tribals. Such cooperatives may be encouraged in other States also.

9. The Ad Hoc Committee considered various forest products to be included in the scope of the terms of reference of the Committee and decided upon the following:-

(1) Myrobalans
(2) Walnuts
(3) Mushrooms
(4) Gum karaya
(5) Kuth
(6) Katha
(7) Agarwood
(8) Rosin and Turpentine.

10. Information was obtained from Chief Conservators of Forests and Heads of Forest Departments in different States and Union Territories, Forest Research Institute & Colleges, Dehra Dun, Agricultural Marketing Adviser, Ministry of Commerce, Indian Standards Institution, National Chemical Laboratories, State Directors of Agriculture and a few private organisations.

CHAPTER III

MYROBALANS

Myrobalans are the fruits of trees belonging to the genus Terminalia of the combretaceae family particularly, Terminalia chebula and T. bellerica and Emblica officinalis of Euphorbiaceae family commonly known as "Harra", "Bahera" and "Amla" respectively. The myrobalans of commerce is usually the dried fruit of Terminalia chebula and is known commercially as "chebulic myrobalan" to distinguish it from the "beleric myrobalan", the fruit of Terminalia bellerica and "arjuna myrobalan", the fruit of T. Arjuna. However, detailed investigations into what passes as chebulic myrobalan showed that species other than T. chebula e.g. T. pallida, T. travancorensis and also probably T. citrina are also found mixed with it. True chebulic myrobalan is the one which is most important for commercial exploitation because of the higher percentage and better quality of tannin in it. While belleric myrobalan may be used for local (Indian) consumption, care should be taken to ensure that it is not used as an adulterant of the chebulic myrobalan in the export trade.

2. The tree Terminalia chebula occurs in the forests of India, Burma and Ceylon. Data on the area under chebulic myrobalans and its annual production are, however, not available. India is the largest exporter of myrobalans and practically holds the world monopoly.

3. Myrobalans are used in leather tanning industry. They cause mellowness in the leather on account of their astringent fermentative and certain acid-forming properties. They are used both raw and in extract form, in the tanning industry. They contain many medicinal properties and are used in the manufacture of ink. The tree provides valuable wood for the manufacture of carts, rice pounders, boats and building

4. This report deals with chebulic myrobalans only as it is this product which is of importance in the export market. Therefore, the term 'myrobalan' wherever used in this report refers to only chebulic myrobalans, unless otherwise specified.

5. Production - No correct estimate of the total production of myrobalans is available. However, enquiries made from various sources place the average annual production at about 80,000 to 1,00,000 tonnes of dried fruit.

6. Areas of production - Myrobalans are found in the forests of Madhya Pradesh, Maharashtra, Orissa, Bihar, Andhra Pradesh, Madras, Mysore, West Bengal and Punjab. The estimated

quantity available in each State is indicated in the following statement:-

	Tonnes	% to total production
Madhya Pradesh		
(a) South Raipur comprising the tehsils of Dhamtar, Mahasamund, Bindra and Nevagarh	30,000	
(b) Bastar District		
(c) Chindwara District	10,000	
(d) Shadol and other areas in ex-Rewa State	10,000	
(e) Raigarh and Sarangarh (including Champa and Bilaspur districts)	5,000	
(f) Amla, Jabalpur and Betul areas	10,000	
	65,000	60.5%
Maharashtra		
(a) Chanda district	2,000	
(b) Konkan area	4,000	
(c) Kolhapur district and Belgaum area	4,000	
	10,000	9.3%
Orissa		
(a) Khadiar	7,500	
(b) Koraput	7,500	
(c) Bolangir	2,500	
(d) Sambalpur	3,000	
	20,500	19.1%
Bihar		
(a) Lohardaga (b) Ranchi (c) Kankulia area	4,000	3.7
Andhra Pradesh		
(a) Godavari valley (b) Nellore district	3,000	2.8%

Other areas

(a) Madras State (b) Mysore State (c) Punjab State (d) West Bengal State	5,000	4.6%
Grand Total...	107,500	100%

However, during normal seasons only 50 to 60% of the total production is collected. This fact is borne out by the figures of exports, quantity utilised by the local tanneries and in the manufacture of tannin extract, the total for the three being equivalent to 50% of the total estimated production Exports account for 27,500 tonnes and another 25,000 tonnes are used by the local leather industry and for the manufacture of tannin extract.

7. In the years when the demand is good, both for export and internal consumption, the collection of myrobalans is as high as 70% of the total production, because of the incentive of higher wages to the collectors who are usually tribals.

Preparation for the market

8. Raw nuts - The nuts after collection are spread evenly on the ground and allowed to dry for about 20 days. They are then collected and stored. When dry, the nuts shrink to half of their original size.

Whole nuts - The different grades of myrobalans are known by the names of the areas from where they are exported. The grades are based on colour, solidity of the nuts and freedom from insect attack. The dried raw nuts are sorted by wholesale merchants into the following grades :-

Grades	Colour	From where exported
1. Jabalpore Js		
G.J.	Brownish colour	Jabalpore
J.I.	Yellow to yellowish brown or yellowish red colour	-
J.II	Black and hollow	
2. Bombay myrobalans		
a) Bimlies Bs		
B J I	Same as JI but yellow	Bimlipatam, Madras
	and light in weight	
B J Average		

b) Rajpores-Rs-

R.J I	Corresponds to B J I of Bimlies	Kohlapur (Bombay)
RJII		

3. Vingorlas - Vs — Bombay forests.

4. Madras Myrobalans — Madras coast.

Madras Coast
or
Madras

NB: These grades are for 'chebulic myrobalans'.

9. Preparation of crushed nuts - Myrobalan crush is exclusively made from 'Jabalpore' while the Bombay myrobalans are exported entirely in the form of whole nuts. There are 5 types of 'crush' made from 'Jabalpore' commercially known as (a) Crush No. I Special, (b) Crush No.I International, (c) Crush No.I, (d) Crushed average and (e) Crushed No.2. The difference in these five standards lies in the varying proportions in which JI, GJ and JII are mixed in the preparation of the crush and also in the percentage of tolerance of myrobalans dust, 'chickenfood' and kernel seeds which are obtained as bye-products during the process of crushing whole nuts. Crushing is done by hand-pounding the whole nuts.

The ratio of the crush to nuts is 3 : 5.

10. Myrobalan extract - The extract can be manufactured either by the Solid Process or as spray-dried tannin powder. In the Solid Process, the open vat extraction method is generally employed. As iron reacts chemically with the tannin solution, the vats are made either of wood with copper or brass fittings or in concrete.

23 tonnes of raw 'Jabalpore' myrobalan whole nuts or 25 tonnes of 'Bombay Myrobalan' yield 10 tonnes of solid extract containing 12% moisture or 8 tonnes of powder extract with 4% moisture. The percentage of recovery thus works out to 40 and 32 per cent for solid and powder extract respectively for Bombay myrobalan.

Seasons for collection and marketing

11. Myrobalan trees in different parts of the country start flowering in April-May. The fruits mature in October-November and when yellow are ready for picking. The collection starts from December and continues upto April.

12. The nuts are sent to the assembling markets soon after collection but the maximum arrivals in these markets are from January to March.

Normal available supplies

13. The estimated available supplies of each grade of myrabolans are as follows:

Types	Tonnes
i) Jabalpores ...	33,000
ii) Bombay myrobalans (Bimlis) Rajpores, Vingorlas)	5,000
iii) Madras Coast myrobalans	10,000
iv) Other myrobalans	6,000
Total	54,000

Demand

i) Consumed by Indian tanneries	20,000
ii) For manufacturing extract	1,500
iii) Exports in terms of whole nuts	27,000
iv) For other purposes	5,500
Total	54,000

14. The following forest divisions produce considerable quantities of myrobalans from reserved forests:-

Madhya Pradesh	Balaghat, North & South Mandla, North and South Raipur, Chhindwara, Malghat, Betul and Jabalpore.
Maharashtra	Amravati, Nasik, Kolaba, Thana, Poona, Satara and Kohlapur.
Orissa	Mayurbhanj, Keonjhar, Bolanghir, Kalahandi and Parlakimedi.
Bihar	Singhbhum and Santhal Parganas.
Andhra Pradesh	Visakhapatnam, East Godavari, North and South Cuddapah, Kurnool.
Mysore	Kanara East, West and Belgaum.
Madras	Salem, Nilgiris, North Coimbatore, Vellore and Thirunelveli.

15. Imports - India being the major producing country of myrobalans, there are no imports from any other country.

16. Exports India is the only supplier of raw myrobalans to world markets. Exports are made as whole and crushed nuts as well as in the form of myrobalan extract. The Indian Standards Institution have formulated specifications

(IS: 2716 - 1964 myrobalan extract) for the extract and the export of myrabolan in this form must be encouraged.

17. U.S.A., U.K., Australia and Pakistan are the main importers of Indian myrobalans (whole), while the chief importers of crushed myrobalans are U.K. and U.S.A.

18. A statement showing the export of myrobalans from India as 'crushed' and as 'whole' nuts from 1961-62 to 1965-66 is given in Appendix I.

19. The export of raw myrobalans has increased in recent years but the trend in the developed countries is to replace vegetable tans by synthetic and chemical tanning materials.

20. Importers expect the delivery of goods expeditiously but exporters in India find it difficult to keep to such schedules due to shortage of railway wagons and shipping space and to the low priority in transport given to this commodity.

21. Besides raw myrobalans, India is also producing myrobalan extract. There are three units (one each at Kanpur, Kharagpur and Kolhapur) in the country engaged in the production of myrobalan extract, with an installed capacity of about 10,000 tonnes per annum. Against this, the production at present is estimated at about 2,000 tonnes only.

22. Grading - The compulsory quality control scheme for myrobalans commenced from 1st December, 1962 and the main factors on which grading is based are colour and extraneous matter.

23. The quantities graded since the inception of the scheme are as follows:-

Year	Qty. graded (tonnes)	Value in thousand Rupees
1962-63 (from 1.12.62)	5,821	932
1963-64	14,563	2,351
1964-65 (Upto end of 1964)	14,060	2,650

24. Efforts should be made to bring a larger quantity of myrobalans under the grading scheme.

Problems in the export trade

25. The incidence of sales tax (6%) on a cheap commodity like myrobalans is comparatively high and adds to the cost. The States concerned may be asked to take steps to reduce

the sales tax on this commodity.

26. Before 1962, myrobalans enjoyed a concessional railway freight rate which was 50% of the standard rates. The question of restoring the old concession may be considered.

27. Another handicap in the export of this commodity is the lower movement priority assigned to myrobalans by the railways. This has been further aggravated by the limited number of wagons placed at the disposal of the exporters who are not able to fulfil their commitments in time. If the exports are to be boosted, the trade should be given higher priority in the allotment and movement of wagons.

28. In order to boost the export of myrobalans, it is necessary that some kind of export incentive, as in the case of some other export commodities, may be given in this case also.

29. The indigenous extract of myrobalan is not popular in foreign countries because the factories there turn out liquid extracts of the required strength or concentration which they are able to despatch in bulk, in specially made tank wagons, for direct delivery to the consuming tanneries. The delivered cost of the solid extract exported from India, which has again to be dissolved in hot water at 90°C, therefore, compares unfavourably with the cost of the foreign liquid extract. The remedy lies in producing myrobalan extract in a form that may be acceptable to the importers.

RECOMMENDATIONS

(1) The State Forest Departments should be requested to protect trees of 'Terminalia chebula' in particular, in addition to the other species of Terminalia which yield myrobalans, where this has not yet been done. These species should not be felled in the coupes.

(2) Where possible, plantations of T. chebula should be raised.

(3) It is necessary that a high tan bearing myrobalans planting stock should be selected by practical trials and this alone should be used for further propagation of the plant in suitable regions of the country. The fruits should be harvested at the proper time of its development while grading and marking should be made compulsory.

(4) Scientific methods of collection, grading etc. have only recently been introduced in this trade. Consequently, the Indian myrobalan has been receiving increasingly less support from the various buyers both in Indian and overseas markets.

(5) Cooperatives should be established for collection and grading of myrobalans in the raw form and for export to foreign countries. Adulteration of 'chebulic myrobalans' with other kinds should not be allowed.

(6) States concerned may be asked to take steps to reduce the sales tax on this commodity.

(7) The old railway freight concession may be restored.

(8) The myrobalan trade should be given a higher priority in the allotment and movement of wagons.

(9) Export incentive should be given to exporters of myrobalans as has been given to some other export commodities.

(10) The indigenous manufacture of myrobalans extract and its export should be encouraged. The extract should be in a form acceptable to the importers in foreign markets.

EXPORTS OF MYROBALANS FROM INDIA APPENDIX - I.

Quantity = Metric Tons . Value = Rs. in lakhs.

Item/ countries.	1961-62 Qty.	1961-62 Value	1962-63 Qty.	1962-63 Value	1963-64 Qty.	1963-64 Value	1964-65 Qty.	1964-65 Value.	1965-66 Qty.	1965-66 Value.
I. Myrobalans Crushed.										
U.K.	12,723	31.74	11,424	32.80	8,854	19.21	10,426	23.10	14,604*	40.74*
U.S.A.	1,599	3.81	1,445	4.00	1,135	2.90	675	1.51	1,148*	2.84*
Netherlands	549	1.45	595	1.65	297	0.71	15	0.04	-	-
Germany West	-	-	-	-	-	-	50	0.12	-	-
Australia.	344	1.00	138	0.42	138	0.41	93	0.48	315*	1.07*
Others.	47	0.10	54	0.26	55	0.19	382	1.37	1,545*	5.88*
Total.	15,282	38.10	13,656	39.13	10,479	23.42	11,641	26.62	17,612*	50.53*
II. Myrobalans Whole.										
U.S.A.	2,215	3.58	1,917	3.22	1,194	1.84	914	1.45	@	@
Australia.	327	0.82	300	0.68	308	0.80	169	0.44	@	@
Pakistan West	1,587	4.01	1,001	2.88	2,278	5.07	3,523	9.19	@	@
Pakistan East.	111	0.24	-	-	118	0.29	160	0.42	@	@
U.K.	2,278	4.21	1,277	2.44	463	0.67	265	0.64	@	@
Netherlands.	50	0.09	100	0.17	-	-	--	-	@	@
Others.	277	0.71	226	0.62	103	0.38	296	0.87	@	@
Total.	6,845	13.66	4,821	10.01	4,464	9.05	5,327	13.01	@	@
III. Myrobalans Fruit Extract.										
U.K.	175	1.24	24	0.18	87	0.55	-	-	-	-
Australia.	328	2.99	216	1.70	61	0.48	88	0.72	32	0.28
Pakistan West.	50	0.56	-	-	43	0.31	63	0.51	171	1.29
Japan.	42	0.33	14	0.13	34	0.31	10	0.07	24	0.23
New Zealand.	116	0.80	128	1.01	14	0.12	64	0.47	54	0.43
Others.	37	0.29	6	0.04	11	0.09	96	0.77	6	0.03
Total....	748	6.21	388	3.06	250	1.86	321	2.54	287	2.26
Total I+II+III	22,855	57.97	18,865	52.20	15,913	34.33	17,289	42.17	17,899	52.79

* During 1965-66 the classification in the Monthly Statistics of the Foreign Trade of India has undergone revision. Thus for 1965-66, separate figures for Myrobalans crushed and Myrobalans Whole are not recorded. This figure relates to Myrobalans Amla plus Myrobalans others.

@ The figure for this item is included under item I above, viz., Myrobalans crushed.

Source: Monthly Statistics of the Foreign Trade of India.

CHAPTER IV

WALNUTS

Occurrence

The Walnut tree (Juglans regia linn) grows naturally in the temperate forests of the Himalayas at an elevation of 1900 m. to 3300 metres. In India its range is from Jammu & Kashmir State in the West to Bhutan in the East. It is also found in the Khasi Hills in Assam where it is cultivated. In Jammu & Kashmir, the tree occurs either in pure groups or in a mixture with other broad-leaved species such as maples, oaks, horse-chestnut and bird-cherry or with conifers, particularly silver fir, spruce and blue pine. Towards its eastern limit, the species is sporadic in occurrence mixed with oaks, maples, laurels, magnolias etc. The tree is found chiefly on deep well-drained fertile soils, in sheltered situations such as moist ravines or depressions in the hill-sides. Pure crops of walnut are sometimes found on the lower gentle slopes of well-drained cup-like depressions in Kashmir.

Production of Walnuts

2. The world production of walnuts is estimated at about 0.14 million tonnes of which more than 50% is from the U.S.A. In India the production and collection of walnuts is confined to the States of Jammu & Kashmir, Himachal Pradesh and the hill districts of Uttar Pradesh, but nuts of good quality are mainly from Jammu & Kashmir. Reliable statistics of the area under walnut [illegible] and the quantity of nuts produced in the country are not available. An ad hoc survey carried out by the Directorate of Agricultural Marketing indicates that the area under walnut [illegible] is about 7,000 hectares and the nut production at about 11,000 to 14,000 tonnes. The State-wise distribution is as detailed below:-

Name of State	Area (hectares)	Production of in-shell walnuts (tonnes)
Jammu & Kashmir	6,700	11,000 to 13,000
Himachal Pradesh	100 to 200	300
Uttar Pradesh	300	300 to 400

The above mentioned States are also raising plantations of walnut in forest areas as a part of their plantation programme. In addition Jammu & Kashmir also proposes to plant up 2000 acres with the edible (thin-skinned) variety during the Fourth Plan period.

3. In India, both the internal and overseas demands for walnuts are increasing steadily. It is, therefore, necessary that the production of walnuts is stepped up. If walnuts are to be raised as a commercial crop, selected areas suitable for walnut cultivation would have to be set aside near habitations. Walnut plantations in the interior of the forests would involve the problem of protection from animals. It is, therefore, desirable that cultivators are induced to set aside some suitable land for raising edible walnuts and plantations which are raised by the State Forest Department should be so planned as to ensure that the collection of nuts is no problem. Scientific manurial and cultural practices must be adopted. The introduction of suitable foreign varieties also deserves particular attention. Good strains of walnuts combining quality and yield have been developed in many countries, notably U.S.A. and some of these strains could probably be introduced in India, also.

4. At present many of the walnut trees are damaged by the practice of cutting away the bark which is largely used as a lip-stainer and a dentrifice. This practice is particularly common in areas around towns and should be discouraged to avoid killing the trees.

Varieties

5. There are three varieties which are recognized in the Indian trade, viz.,

(a) Kaghzi (thin shelled walnut)
(b) Katha (hard shelled walnut) and
(c) Medium.

The kaghzi variety is characterised by having thin and brittle shells and plumpy and large kernels while katha has a thick hard shell and is difficult to crack-open and to take out the kernels. The nut is also of a smaller size. The medium variety is more or less intermediate in character between Katha and Kaghzi. Kaghzi walnuts seldom enter the export trade because of a well developed internal demand and the high cost of containers for packaging this brittle shelled variety for export purposes. Katha or the hard nut variety is consumed in the producing areas. It is only the medium type which enters overseas markets because of its ability to withstand rough handling and its moderate price.

Harvesting and preparation for the market

6. Hull splitting of fruits and nut drops are natural indications of advancing maturity of the fruits. Harvesting of walnuts starts from August and continues till November but the season of harvesting is linked with the distribution of rainfall. In years of delayed rainfall, harvesting is delayed sometimes by about 10 to 15 days.

7. With advancing maturity, the nuts begin to drop from the tree. The common method of harvesting is by beating the

branches to detach the fruits. Hulling is commonly done by collecting the day's harvest in heaps and covering them with walnut leaves and straw. A few days later, the softened hulls are peeled off and the nuts washed in nearby streams. The nuts are dried for a few days in the open before being consigned to the markets.

8. Bleaching, especially of exportable nuts, is done not by the cultivators but by the traders in Jammu & Kashmir and Delhi. The chemicals commonly used for the purpose are soda ash, caustic soda, quick lime, bleaching powder, hydrosulphide of soda and sulphuric acid solution. Shelling is done by hands. Automatic shellers, as are commonly employed in other countries for separation of the kernel from the shell, have not yet been introduced in India. Manual shelling is a slow process and is also expensive. It is, however, said to ensure better extraction of kernels. In some cases bleaching is done, particularly by the traders before putting the nuts to sale. The method generally employed for bleaching is as follows:

The nuts are dipped for 5-10 seconds in a mixture of 9 kilos of Calcium Carbonate and 12 kilos of Calcium Chloride dissolved in 225 litres of water. 130 gms. of Sulphuric acid is also added to the solution.

Utilisation

9. Walnuts are prized as a dessert and are extensively used in confectionary, chocolate and bakery industries. They are also a source of a dye of black and green hues. Unripe fruits are used by the local people as an efficient fish poison.

10. Oils extracted from walnuts (yield 45 to 60%) are used for culinary purposes, luminary objects and paints. Walnut cake and meal are considered good livestock feeds. Walnut wood is a valuable timber and the bark is used as a dentrifice and tainter. Hulls which now go waste are a rich source of Vitamin C and can yield organic dyes. Shells are commonly used for tanning purposes and are also a cheap source of fuel. In the powdered form it can be used in the manufacture of plywood, hard-board, roof tiles, paper, glue, linoleum, as diluent for explosive grits and insecticidal dusts and also as a retarder in the rubber tyre industry.

Marketing seasons

11. In the up-country market, the demand is greater in the winter months but in big cities and towns there is a continuous demand all round the year.

12. The season starts with the advent of winter, but the peak selling and buying activity takes place during December. Shipments of freshly harvested whole walnuts start from September and attain a peak during October to December and thereafter

decline gradually. The months of lowest exports are June, July and August.

Assembling Markets

13. The most important assembling markets for walnuts are Jammu, Srinagar and Delhi. Walnuts for the indigenous market are distributed mainly from Delhi. Exports to oversees markets take place chiefly from Bombay. In Himachal Pradesh, since the trees are scattered and there are no large sized consolidated plantations at present, each farmer has a limited quantity of nuts which he cannot afford to transport to distant markets. The produce as such is sold to local shopkeepers (traders) or sold in the fairs held annually in the area. It is generally purchsed on behalf of the commission agents/traders in the bigger markets like Delhi.

14. Little or no grading of the nuts is done by the producers themselves. The traders and retailers usually sell the nuts after grading them by quality and sizes. These are generally graded as thick-shelled (katha), thin-shelled (kaghzi) and an intermediate grade (medium). Each grade is then sub-divided generally into three sizes - large, medium and small. Kaghzi nuts with white kernels fetch better price than brown coloured kernels. It may be mentioned here that the Government of India have introduced 'Agmarking' of walnuts with effect from the 1st September,1964. Under this Act, all the produce has to be graded and 'Agmarked' according to the specifications laid out for the purpose, before being exported to foreign markets.

Export

15. Indian walnuts are exported to a number of countries among which the U.K. is the biggest buyer. This is primarily due to the fact that U.K. imports largely in-shell walnuts and kernels of inferior quality (brown and amber) which are comparatively cheaper than the light kernels imported by U.S.A. and Canada. Canada is the second important importing country followed by U.S.A. Shelled walnuts of superior quality are exported to U.S.A. while Australia, which ranks fourth, among the importing countries, is a very good market for brown kernels.

16. The details of exports from India during the period 1961-62 to 1965-66 and their values are given in Appendix I.

17. On an average, about 5,000 tonnes of walnuts valued at Rs. 1.37 crores are exported from the country annually. During the last five years, there has been a gradual fall in the export of walnuts. One bright feature, however, is that during the last two years, India has been able to enter into some new markets like the U.A.R., Germany (both East and West), Japan etc.

Prices of Indian Walnuts Vs. Walnuts of other countries.

18. In the export markets, Indian walnuts are said to be fetching comparatively lower prices than those from other countries. This price differential is attributed to poor grading, excess of foreign matter and the incidence of worm infested nuts. With the introduction of compulsory quality control in respect of walnuts, some improvement in the quality of supply has been effected, although there is scope for further improvement through systematic adoption of fumigation, better packaging and better dyeing. One of the complaints received after the introduction of compulsory quality control was the excess of moisture and under-developed nuts in the first shipment that was sent to U.K. to catch the Christmas season.

RECOMMENDATION

(1) The economic importance of the walnut trees lies mainly in their three important uses, namely:

(a) supply of timber which is greatly prized for decorative wood work and for furniture;

(b) Supply of kernels for edible purposes; and

(c) extraction of a high grade **dyeing** oil from the waste kernel for artist's paints and colours.

At present walnut plantations are located mainly in inaccessible forest areas and there is no organised effort for the production of quality walnut fruits, their collection, grading, handling, storage and utilisation. In order to step up the production of walnuts in the country, the existing plantations should be improved through adoption of better horticulture techniques. Improved strains of walnut should be developed for obtaining better quality fruits.

(2) New plantations in compact blocks should be raised in the States of Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh. Suitable personnel should also be trained in horticulture to look after these plantations more effectively. Private growers should also be encouraged to grow quality walnuts in sizeable areas. For this purpose suitable planting material and subsidy should be given to them, together with the necessary guidance in its cultivation, in the use of fertilizers and plant protection measures.

(3) Good varieties of walnuts from U.S.A., France and other advanced countries should be introduced for trial in the Himalayan regions of India.

(4) The practice of debarking the trunk of trees for use as a dentrifice should be discouraged.

(5) At present, chiefly the medium varieties of walnuts are being exported. These have medium sized kernels and in the European market there is a tendency to prefer small wholes particularly in the confectionary industry. Supply of small wholes should, therefore, be progressively encouraged.

(6) The methods adopted for bleaching, sorting, drying, shelling, grading, storage and packaging are crude and cumbersome and call for improvement. This can be effected by:-

(i) harvesting the nuts at the optimum stage of maturity;
(ii) drying them adequately;
(iii) standardising bleaching methods;
(iv) better packaging; and
(v) effective fumigation.

(7) In advanced countries, subsidiary industries have been successfully built up for the profitable utilisation of green husk, dried shells and inedible kernels and for the production of oil for artist's paints and colours. It is, therefore, desirable that the feasibility of setting up similar industries for the profitable utilisation of these materials, which are commonly wasted in India, may be examined. This would also reduce costs.

(8) Agmark standards provide for sorting out of the produce according to size, colour, good cracking quality and also guard against invisible or internal defects, visible or superficial defects, insect infestation and extraneous matter. It is hoped that with the proper and strict observance of the compulsory quality control scheme, there would be a significant improvement in the quality of our exports. This is essential if Indian walnuts are to compete successfully with the produce of other countries, notably U.S.A., France, Italy and China.

(9) Harvesting of the fruits should be undertaken under expert guidance so that their collection, storage and handling do not result in any wastage. The fruit should be properly graded and marked before marketing.

(10) The walnut producing states should conduct a survey to assess the areas under walnuts and the annual production thereof. This will help in scientific planning and augmenting production for the future.

(11) The research and development departments of the State Governments need to be geared up to extend technical help and supply grafted plants of high quality walnuts at subsidized rates to the prospective growers.

APPENDIX I

EXPORTS OF WALNUTS FROM INDIA

Quantity : Tonnes
Value : Rs.in Lakhs

Countries	1961-62		1962-63		1963-64		1964-65		1965-66	
	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value
U.K.	2,936	68.35	2,772	62.07	3,506	86.54	3,033	76.47	2,731	77.23
Canada	914	39.69	540	22.12	354	15.36	355	15.58	408	13.95
U.S.A.	473	17.30	337	12.39	363	14.67	442	17.37	233	9.51
Australia	432	9.66	509	11.52	517	13.43	327	10.48	260	7.12
Germany West	152	2.46	130	2.20	141	2.77	50	0.91	166	3.75
Switzerland	239	6.44	2	0.07	72	1.60	57	1.28	59	1.32
New Zealand	12	0.47	23	0.80	11	0.54	15	0.61	11	0.47
Netherlands	58	1.05	35	0.63	29	0.58	..	-	237	5.02
Others	233	4.92	796	16.52	621	13.18	595	14.10	115	3.03
Total	5,449	150.34	5,144	128.32	5614	148.67	4874	136.80	4220	121.40

Source: "Monthly Statistics of the Foreign Trade of India".

CHAPTER V

MUSHROOMS

Mushrooms are not only a rich source of edible proteins particularly for vegetarians, but have considerable export potential. The production of mushrooms in the country is very limited but there is enormous scope for increasing this production on a commercial scale as is being done in Japan and other countries.

2. Cultivated mushrooms find a place in human diet not only because of their good flavour but because of the high food value which they possess. This food value is increased by the addition of milk and butter which are often used in the preparation of mushroom recipes. Though mushrooms contain less proteins than fish or meat they compare favourably with most fresh vegetables. They also have a high mineral value, almost twice that of other vegetables. They contain copper, iron, potassium, phosphorus and calcium. Being entirely devoid of starch, they serve as a useful food for diabetic patients. These are an excellent plant source of riboflavin, nicotinic and pantothenic acids. They also contain appreciable amounts of Thiamin and Biotin and are by far the largest source of Ascorbic acid, which is so useful for treating anaemic conditions in patients.

Occurrence

3. Mushrooms are found in abundance in forest areas from where they are collected during the season, usually commencing from the end of June. Mushrooms which are indigenous have not yet been successfully cultivated in India. The fruiting bodies are gathered, washed in water and dried in the sun. In the green stage, they are susceptible to insect (maggot) attack. About 8 kilograms of fresh morchella yield one kilogram of the dried product.

4. The species of Indian mushroom (Morel) which is in demand in Western Europe is Morchella conica Linn (Gucchhi). Other important edible varieties of mushrooms that grow in India include (i) Morchella esculenta, Linn (Gucchhi), (ii) Morchella angusticeps Linn (Gucchhi), (iii) Morchella conica Linn (Gucchhi) and (iv) Cantharellus cibarius Fr. (Dhingri).

5. Occurrence of Morchella conica has been recorded in Dehra Dun. Morchella esculenta occurs abundantly and is available in Amritsar, Ranikhet, Kumaon and Kashmir. Dried mushrooms are largely supplied from Kashmir and Himachal Pradesh. Kulu valley alone is said to produce annually about 20 quintals (dried) of edible mushrooms.

Marketing

6. There does not appear to be any firm in Punjab, Himachal Pradesh or Kashmir which directly exports dried mushrooms to foreign countries. In this region, particularly in Kulu, there are suppliers who sell their goods to dealers in Amritsar and other places. Apart from some small-scale suppliers in Delhi, Calcutta and other places who are trying to come into the export trade, export of mushroom is largely handled by a few firms which have established connections in France, Switzerland and other countries. Some of these firms are at Bombay and some at Kanpur.

Prices

7. In 1961, exporters in India offered dried black Morels (mushrooms) at Rs.43/- per Kg. and dried white Morels at Rs.29.50 per Kg. f.o.b. Bombay airport. Early in 1962, prices quoted for dried black mushrooms went upto Rs.60/- per Kg. f.o.b. Bombay airport. Prices of mushrooms appear to fluctuate considerably during different months of the year depending on availability of supplies. In Europe prices vary according to availability of the commodity in the world market. According to importers in Switzerland, the price of Indian mushrooms should be below 30 shillings per pound f.o.b. Indian airport, except when scarcity conditions prevail.

Quality and packing

8. Consumers in different parts of Europe seem to have distinct preferences for particular qualities of mushrooms. Strict quality control has become necessary before dried mushrooms are exported since there have been instances in the past when consignments of dried mushrooms shipped from India to France were rejected at destination on account of their poor quality. Importers in Europe prefer quick delivery which can be ensured only by consigning the goods by air. In Switzerland, where customs duty is levied on weight, consignments exceeding 5 Kg. are preferred. Indian exporters usually pack about 8 Kg. of mushrooms to a basket, wrapped in gunny cloth or packed in cardboard cartons. Before packing in boxes, it is advantageous to pack the dried mushrooms in perforated plastic bags free from moisture.

9. In Europe, dried mushrooms are produced by different processes like hot air-drying, vacuum-drying, and infra-red heat. After the drying process, the product is packed in large metal containers or wooden cases lined with cellophane or kraft paper.

10. Labels used on tinned mushrooms are required to bear the name and address of the manufacturer, the variety of mushrooms and the net weight of the contents. The name of the country of origin is also required to be embossed on the top or bottom of the tin. Tins and aluminium foil are often used for packing dried mushrooms.

Demand for exports

11. There appears to exist a sizeable demand in Europe for morels, particularly of the variety Morchella conica. Marketing prospects are favourable in Switzerland, France and West Germany, provided regular supplies and good quality are ensured and the main centre for export is Bombay.

Exports

12. Mushrooms, as such, are not separately specified in the "Monthly Statistics of the Foreign Trade of India". The annual average export of different items such as mushrooms, brussels sprouts, artichokes, broad beans, celery, parsnips etc. is estimated at 20 metric tonnes for the last five years. This covers sun-dried forms only.

13. The quantity and value of exports of mushrooms, brussels sprouts (canned) etc. during the five years from 1961-62 to 1965-66 are given in Appendix I.

Grading

14. The Directorate of Marketing and Inspection has framed grades and grade specifications for Indian dried edible mushrooms under the Agricultural Produce (Grading and Marking) Act, 1937. These specifications cover the following four edible species of Indian Mushrooms: (i) Morchella esculenta, Linn (Gucchi), (ii) Morchella angusticeps Linn (Gucchhi), (iii) Morchella conica Linn (Gucchhi) and (iv) Cantharellus cibarius Fr. (Dhingri). Four grades designations i.e. Mushrooms M.L., Mushrooms M.A., Mushrooms M.C. and Mushrooms CC have been provided, one each for the four varieties of mushrooms mentioned above.

15. Important factors taken into consideration in the grade specifications are (i) absence of smoky or any other odour not characteristic of mushrooms; (ii) freedom from sand, grit and other extraneous matter like saw-dust, wood pieces etc; (iii) freedom from moulds, moths, mites or other insects, alive or dead; (iv) added colouring matter, bleaching agents, artificial flavouring of chemical preservatives; and (v) mixtures of different species.

RECOMMENDATIONS

(1) All practical data gathered as a result of researches being done under different organisations like Indian Council of Agricultural Research and Council of Scientific & Industrial Research for cultivation of mushrooms should be disseminated to encourage the private sector to undertake the organisation of mushroom cultivation in suitable areas of the country, on a commercial scale.

(2) Enterprising private sector organisations should be encouraged to set up industrial units for the mass production of edible mushrooms and they should be provided necessary facilities such as planting material, machinery and financial assistance.

(3) A delegation consisting of two or three technical officers connected with the development and research of mushroom cultivation in India, should be deputed to Japan to study the cultivation practices of mushrooms on a commercial scale and to acquaint themselves with the latest techniques employed for the advancement of this industry.

(4) The technique of the artificial cultivation of some important edible mushrooms should be standardised and pure culture spawns should be prepared for supplying to different growers. A centre for the supply of spawn should be set up under the aegis of the I.C.A.R.

(5) Prospective growers should be trained in various aspects of mushroom cultivation and given technical guidance.

(6) Mushrooms should be classified separately as an independent item in the "Monthly Statistics of the Foreign Trade of India". This would facilitate the assessment of progress in the export of mushrooms and also in planning for increased production for export purposes.

(7) Quality control should be introduced in mushrooms before export.

APPENDIX I

EXPORTS OF MUSHROOMS, BRUSSELS SPROUTS ETC. (CANNED) FROM INDIA

Quantity : Metric tons
Value : Rs. in lakhs.

Countries	1961-62		1962-63		1963-64		1964-65		1965-66	
	Qty.	Value	Qty.	Value	Qty.	Value	Qty	Value	Qty.	Value
France	5	1.21	4	2.03	3	1.79	4	3.09	4	2.58
Switzerland	8	1.15	8	4.02	14	7.34	18	12.83	19	14.51
Others	Neg.	0.01	3	0.78	1	0.69	1	0.57	2	1.08
Total	13	2.37	15	6.83	18	9.82	23	16.49	25	18.17

Neg. Negligible

Source: "Monthly Statistics of the Foreign Trade of India".

CHAPTER VI

GUM KARAYA

Gum Karaya is a dried exudation produce obtained by tapping trees of Sterculia urens Roxb. and some other species of Sterculia (Fam. Sterculiaceae), which are deciduous and are found commonly in dry and rocky areas. The gum resembles Gum Tragacanth (Astragalus gummifer Labillardiers) or other species of Astragalus in that its property of swelling in water instead of dissolving. During World War I, the principal users of Gum Tragacanth in U.S.A. switched on to the use of cheaper substitutes when Gum Tragacanth became a scarce and costly commodity. The demand for Gum Karaya has ever since increased and it now forms an important raw material in many industries like textiles, cosmetics. food, pharmaceutical, etc.

Area of Production and mode of extraction.

2. The trees of Sterculia urens have their origin in India and are known locally as "Khakra" or "Kulu" while the gum is termed karaya, katila or katira. The trees are deciduous and of moderate size, reaching a height of 25 to 40 feet with large trunks of soft corky structure. They have large spreading crowns and occur gregariously mixed with a number of other species in the dry deciduous forests of Madhya Pradesh, Rajasthan, Orissa, Gujarat and Maharashtra, particularly in rocky areas.

3. For extracting the gum, usually 5 to 6 incisions are made in the trunk of each tree depending on the girth, each incision being about 2 feet long and deep enough to reach the heartwood. The sap that oozes out collects in the form of irregular or vermiform knobs in the incisions. The knobs are dug out at intervals of about 3 days and new accumulations collect in the same incisions. If the gum is not regularly collected, the wounds heal up and new incisions at other places must be made. Trees yield gum generally for 8 or 9 months and then cease to do so for 2 or 3 years after which they can be tapped again. The best gum is obtained during the hot season, viz., between March to June, there being no exudation during the rainy season. The local inhabitants collect the gum during the hot season which is the slack agricultural period. The gum is sold to the petty merchants, who in turn, sell it to the exporters in Bombay. The extent of production in the various States is as follows:-

State	Market places	Percentage production
1. Madhya Pradesh	Ratlam, Indore, Satna, Katni, Chindwara, Raipur, Dhamtari, Khetra, Shivpur, Kalan, Onkareshwar, Betul, Durg.	50%

2.	Rajasthan	Abu, Nana, Sirohi, Pindwara, Udaipur.	15%
3.	Gujarat	Dohad, Godhra, Rajpipla, Tulod, Chota-Udaipur, Modasa, Khed-Brahma.	15%
4.	Orissa	Jharsuguda, Sambalpur, Daulat-ganj.	10%
5.	Maharashtra	Chanda, Gondia, Khandesh (Shripur).	10%

4. Tree species which yield Gum Karaya occur chiefly in this country and to a very limited extent in Ceylon. The Australian Wattle gum belonging to the same group of Tragacanth gums is considered to be inferior to the karaya quality. The qualities of Kuteera (Cochlospermaceae), Sterculia tomentosa, Sterculia cordifolia (found in regions of Senegal, West Africa and the other adjoining territories) are also considered to be inferior and, therefore, less in demend.

Processing and Grading

5. Bombay is the most important assembling market both for the internal and export trade. Exporters and dealers gather about 8 to 10 thousand tonnes of raw gum which arrives from different States in the form of lumps as irregular big tears which are then broken into crystals, crushed in mills and subjected to differential sieving and winnowing. The gum is finally sorted out in piles by skilled women labourers according to their (i) colour, (ii) bark content, and (iii) other foreign matter like sand etc. This is usually done by the shippers. From the finer sorts like dust and pulvis, the bark is removed at the milling stage.

6. Shippers have also to take precautions against other factors like moisture (Chikanai), the percentage boldness of the contents of middlings or siftings and ensure the consignment against the necessary purity and hygienic standards, especially in the case of the superior grades which are meant for use in the food industry. Of the superior grades, the best is bright white and the poorest are dark brown, dull and black, in colour. These grades are based on considerations of external appearance of the gum crystals; the grades are not subjected to any chemical or other purity-tests, as such.

Standardisation of Quality

7. Standardisation of this product is very difficult. Its main commercial requirements are the purity and viscosity or

swelling properties which are based on climatic and other considerations that cannot be controlled, the gum being a natural product. Efforts made in this direction by the British Standards Institute with the help of leading scientists representing British users of Gum Tragacanth revealed that the task is almost impossible as the gum quality varied considerably, owing possibly to climatic conditions. A committee appointed to find a satisfactory method of testing the quality of the gum failed to obtain any results. It is only in the U.S.A. that the Gum Association of New York has formulated the following standard:-

Grade	Colour	Maximum tolerance for extraneous matter.
1.	Whitish	0.5%
2.	Pale yellow to light brown	1.5%
3.	Brown to dark brown	3.0%

8. In the case of consignments to the U.S.A., apart from the above standards, the exporter has to be particularly careful as he has to ship a consignment against a certificate to be issued by the General Superintendence Co. Ltd. of Bombay, which does not finally absolve him from claims for inferior quality. Doubtful consignments are subjected further to the National Formulary Specifications, in order to have a complete check over the macroscopical and microscopical identifications. To over-come these difficulties, at times Bombay shippers combine consignments of the same quality so that if any is rejected on account of purity (freedom from excreta) etc., their agents at the other end may take recourse to either cleaning the consignment or dispose off or resell the whole, as a lower grade product.

9. For these and other reasons such as the requirements of buyers from different importing countries, the Bombay shippers have devised their own several grades. The draft Agmark standards, if adopted, would go a long way in eliminating some of the misgivings in meeting the needs of standards that are necessary for exporting the gum for use in importing countries.

The specifications do not appear at this stage to aim at imposing any stringent restrictions over the testing of the quality of gum, chemically.

Constituents

10. Karaya gum consists chiefly of gelose galactose. On hydrolysis, it yields among other products, acetic acid and galactose; when hydrolysed with phosphoric or sulphuric acids, the volatile acidity number varying from 13.4 to 21.3 (expressed

in terms of acetic acid) is obtained. This is much higher than the volatile acidity number of 2 to 2.94 for Gum Tragacanth. On long standing, the gum develops a distinctive odour of acetic acid; dissolved in water it has an acid reaction with its pH (1% Sol.), about 4.6; when finely powdered the gum remains suspended in water, each particle swells and the appearance and behaviour of the solution is more like a homogenous solution unless it is ground extremely fine beyond 200 mesh size) or subjected to a treatment in an autoclave. The latter treatment does "solubilize" it to the extent of yielding a water-soluble gum, like Gum Arabic. From the industrial point of view, it is the viscosity that is most important in the case of Karaya Gum, which factor is affected by the season of the year in which the gum is tapped and the area of collection, apart from conditions of growth etc.

Admixtures

11. The different admixtures of gums like "Ghatti" gum (Anogeissus latifolia) found in forests of Maharashtra and Madhya Pradesh are all identified in the shippers' premises by skilled women labourers while sorting out the primary grade, as only Gum Karaya has the peculiar tear structure. This is invariably done by the exporters as the importing countries subject the consignments to chemical and viscosity standards in Government laboratories.

Uses

12. Apart from the many diverse uses narrated earlier, the gum is used in U.S.A. for the preparation of Finger wave Lotions for the Beauty Trade. It has excellent advantages in the production of industrial projects, i.e., in the pharmaceutical, paper, food and textile industries. In combination with latex, it is used in the manufacture of composite building materials.

13. Its superior grades find use in ice-cream preparations, various food products and in the preparation of some medicines.

14. The lower grades are useful in many branches of textiles and in the preparation of varnishes, lacquers, inks, rubber compositions, linoleum, oil-cloth, paper coating, polishes and engraving processes. Karaya gum is thus considered to be an important industrial base.

Storage

15. The gum is required to be stored in cool and dry places. In its powdered form, it should be stored in well-closed containers in order to prevent access to moisture. It is also necessary to store graded and ungraded gum in clean and hygienic premises and prevent the consignments from being contaminated with rodent excreta, birds droppings etc.

Export Demand

16. Exporters at Bombay assemble about 7-10 thousand tonnes of Karaya gum in the raw form, depending upon the position of supply and demand, and export about 5,000 tonnes annually after processing it. The most important importing countries are U.S.A., France, U.K., West Germany, Italy and Japan. The average annual exports of Karaya gum and the values thereof from 1961-62 to 1965-66 are given in Appendix I.

17. There are 13 exporters of gum Karaya in the country, 11 of them operating from Bombay while two are in Katni in Madhya Pradesh.

Competitors in the world market

18. India enjoys a virtual monopoly of the trade; supplies on a restricted scale are also obtained by U.S.A. from Pakistan and Sudan, though the species Sterculia urens does not occur in any of these countries.

It has also to compete against other thickening materials like Gum Tragacanth from Iran, alginates from Japan and North Europe and also against gelatine and other substitutes.

19. The natural gum in the food and pharmaceutical industry has been threatened by the development of seaweed products. Agar agar is one of them. It is possible that these seaweed products may eventually replace the natural gums in many industries.

RECOMMENDATIONS

(1) The Forest Departments of the States where the species Sterculia urens occurs naturally may be requested to protect the trees and to raise this species in plantations where possible. Young plants that come up naturally in the forest should be encouraged.

(2) Existing methods of tapping must be improved to ensure that the trees are not unnecessarily damaged and killed by excessive tapping. The Forest Research Institute, Dehra Dun, may be asked to evolve improved tapping techniques for this purpose and to ensure the maximum sustained production of the gum. The highest priority should be given to this work.

(3) Collection of the gum has to be improved to ensure the exclusion of chips of bark, dust etc. For this purpose, the collection of the gum would have to be organised to allow for frequent collections. Tribal cooperative societies

could undertake the collection and marketing of the gum. Under the supervision of field officers, better quality can be ensured. In the collection, packing and storage of the gum, the Forest Research Institute, Dehra Dun, in collaboration with the Central Food Technological Research Institute, Mysore, could advise on improvement of methods of collection, packing and storage.

(4) The storage of the gum at the exporting centres has also to be improved to protect the gum from extraneous matter. Since Gum Karaya is an edible product, sanitary conditions in storage must be ensured. For this purpose, it may be necessary to prescribe inspection of export consignments.

(5) The Indian Standards Institution may be requested to undertake the preparation of standards for Gum Karaya particularly for the foreign market.

APPENDIX I

EXPORT OF GUM KARAYA FROM INDIA

Quantity - Metric Tons
Value - Rs. in lakhs.

Country	1961-62		1962-63		1963-64		1964-65		1965-66	
	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value
U.S.A.	3004	74.57	3339	98.63	3217	107.55	3398	115.05	3707	125.14
France	655	17.20	782	24.20	605	22.49	564	21.46	684	24.31
U.K.	478	13.29	462	14.82	614	22.14	473	18.37	453	16.54
Germany West	232	6.10	279	8.34	310	9.66	322	10.47	66	2.40
Other countries	200	6.75	194	7.37	252	10.44	192	8.48	416	14.85
Total	4569	117.91	5056	153.36	4998	172.28	4949	173.83	5326	183.24

Source - "Monthly Statistics of the Foreign Trade of India".

CHAPTER VII

K U T H

Kuth (Costus root) is the root of the plant Saussurea lappa (Clarke) belonging to the family Compositee. It is cultivated in the Lahaul and Spiti valleys of Himachal Pradesh, in Jammu & Kashmir and to some extent in the hills of Uttar Pradesh. It occurs and grows at an altitude of 3,000 to 4,000 metres. About 450 tonnes of roots, which is the useful part of the plant, are produced annually in Lahaul and Spiti valleys of Himachal Pradesh and about 150 tonnes in Jammu & Kashmir. Negligible quantities are also obtained from other parts of Himachal Pradesh and from Uttar Pradesh.

2. Kuth had till recently been one of the important traditional foreign exchange earning commodities of India. It has been used chiefly for burning as an incense in Tibet, China and other countries in the East. The prices for the indigenous root have been fairly attractive. Substantial quantities have also been used in the manufacture of incense-sticks and in indigenous systems of medicine. However, since the Chinese aggression, most of the export trade has been lost to India. Information on the production and marketing of Kuth in the States where it occurs or is cultivated is given below:

Jammu & Kashmir

3. Kuth and its trade had been a traditional monopoly of Jammu & Kashmir State Government. A special Kuth Regulation Act as old as 1921, had been enforced to prohibit the unauthorized export or possession of any part of the plant. Regular working schemes for exploitation and propagation of Kuth had been prepared for different areas. It was also cultivated to augment natural regeneration and stocking as also to extend the areas of natural Kuth and improve the quality. The chief places in the States where kuth grows abundantly are in the Kishenganga valley from Tilail down to Karnah and the higher elevations of Chenab Valley constituted by Bahlesh, Bonjwab, Padar, Dhachan and Marwa.

4. Despite adverse market conditions, kuth from Jammu & Kashmir was being regularly sold in that State till 1962, though in reduced quantities because of the poor trade relations with China, the major importing country. Since 1962, however, due to complete stoppage of trade with China, the production and exploitation of kuth received a severe set back. As a result, fresh collections of the root had almost stopped and a huge stock-pile of about 450 tonnes remained accumulated in the Forest Department godowns at Baramula and Jammu.

5. Kashmiri kuth, by virtue of its superior quality, fetched higher prices in the open market. The highest rate obtained in the recent past (1960) was Rs.326.83 per maund, i.e. Rs.883 per quintal.

Himachal Pradesh

6. Detailed information in respect of the introduction of kuth roots in this Territory is not available. It is, however, known that kuth was introduced in Lahaul from Kashmir in about 1923 where it has since been cultivated.

7. Kuth is also found to a limited extent in the Pangi Valley of Chamba district and in Kinnaur district. In the Pangi area, kuth does not occur in forests, but the local inhabitants cultivate it in their fields like other agricultural crops. In Kinnaur district, however, it grows naturally, though sporadically in forest areas and the local people collect and sell it under recorded rights. The quantity grown in the fields or collected from the forests by the villagers is exported outside Himachal Pradesh and there is no internal consumption. No record of the production figures of this crop is maintained in Himachal Pradesh, but it is estimated to be about 50-60 quintals annually. No information regarding present prices of this commodity is available from Himachal Pradesh.

Uttar Pradesh

8. Kuth cultivation was started in North Garhwal Division from 1931, with 20 acres in Bhuna. This was subsequently extended to another 26 acres in Rajmora during 1935, 11 acres in Bhanola during 1938, 15 acres in Danperi and 11 acres in Nimdera during 1939. At present kuth plantations extend over 70 acres and the estimated yield of dried kuth roots is about 16 tonnes per acre. Attempts to introduce the plant in Chakrata Forest Division have also been made recently.

Medicinal properties attributed to the root

9. According to the indigenous system of medicine, the root is a tonic, stomachic, carminative and stimulant. It is also useful in asthma, cough and cholera. It is indicated in chronic skin diseases and rheumatism and is said to have a remarkable effect in controlling bronchial asthma especially of the vagotonic type. The root powder is used for preserving woollen clothes against moth attack.

Composition of the roots

10. The roots are reported to contain an essential oil, an alkaloid, saussurin, a resin, inulin, traces of a bitter substance, tannins, fixed oil and sugars. The presence of the alkaloid saussurin is, however, considered doubtful by some workers in this field.

Extraction of oil from the roots

11. The conventional method used for obtaining the oil is the steam distillation of root. Yields varying between 0.3 to 1.5% have been reported.

12. The oil which is yellow to brown in colour possesses a peculiar and lasting odour which is slightly animal like and is reminiscent of violets, orris and vetiver.

13. The oil contains aplotaxene, costus acid, costol, costus lactone, dehydrocostus lactone and traces of phellandrene, camphor etc. Creditable work on the oil has been done by Sorm and co-workers in Czechoslovakia.

Work done in the National Chemical Laboratory, Poona

14. The roots contain a number of components which are adversely affected by the high temperature during processing by steam distillation. Hence this method is not a suitable one for isolating the oil in the form in which it exists in the roots; a low temperature procedure has been developed in the National Chemical Laboratory in which petroleum ether (40° to 60° F) is used as the solvent and all the operations are carried out at 40° F (plus) 2°F. The process has been successfully tried on a pilot plant scale also and has been patented in India and abroad.

15. The yield of oil obtained by this procedure is higher than by the conventional method viz., about 6% in the case of roots from Kashmir and 4% in the case of roots from Himachal Pradesh. The oil is free from any polymerisation and denaturing and the properties of oil samples taken from various batches closely agree. This oil has been found to contain about 50% of solid lactones which can be easily separated by step-wise cooling of the oil extracts to 0° F. and -20° F.

16. The solid lactone mixture has been shown to consist of two lactones as the major components. One of these - costunolide, is a new sesquiterpenoid lactone, which does not occur in the commercial oil. The other lactone, dehydrocostus lactone, is known to be a constituent of the commercial costus root oil but its proportion in that oil is poor. In the oil extracted by the new procedure this lactone is present to the extent of about 35%.

17. Besides these two lactones, this oil contains dehydrocostunolide, dihydrodehydrocostus lactone, 13-methoxy-dihydrocostunolide, B-selinene, B-elemene, aplotaxene, costol, B-sistesterol, stigmasterol, betulin and dihydroionones etc.

18. The oil that remains behind after separating the solid lactones is more stable than the whole oil and has been found acceptable for perfumery purposes by well-known perfumery houses abroad. Substantial quantities of this oil have been

supplied to reputed firms in U.K., U.S.A. and France.

Uses of the oil

19. The oil finds use in high grade perfumery of the heavy oriental type.

20. The quantity needed for this purpose is, however, limited when compared with the amount of oil, which would be obtained by extracting all the available quantity of roots. It is, therefore, necessary to explore other uses for the oil and its products.

In the private sector efforts are being made to set up a steam distillation plant for the extraction of this oil at Kulbi (Himachal Pradesh).

Project sponsored by the Punjab Government

21. The Punjab Government have sponsored a project in the National Chemical Laboratory to find out how best the roots

RECOMMENDATIONS

(1) Efforts should be made by the State Trading Corporation to develop the recently found foreign markets of Hong Kong, Ceylon, France and Afghanistan for the export of Kuth, as exports to China, the erstwhile major buyer, have been stopped since 1962.

(2) Small quantities of kuth roots have been used indigenously in the manufacture of Indian attars. The roots have also been exported to France for the distillation of its essential oil and for the extraction of resinoids. This export of kuth roots to overseas manufacturers of essential oils, resinoids etc. should be encouraged.

(3) On account of the fall in the demand for kuth roots and also because of careless handling by the contractors who obtain the right of extracting the roots in the forest areas, the market for the roots is rapidly dwindling. This has resulted not only in loss of an important trade item to the country but also in unemployment among the people engaged in the cultivation and collection of the root in the States of Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh. Consequently, every effort has to be made and high priority given to revive the trade on a sound and scientific basis.

(4) The research and development work carried out at Forest Research Institute, Dehra Dun, on the economic utilisation of kuth roots has shown encouraging results. Its further extension by the scientists at National Chemical Laboratory, Poona, has now given a new opening for expanding the scope of utilisation of kuth roots. An effective method for extraction of the oil of kuth roots in the form in which it is found to be present in the roots has been developed by National Chemical Laboratory and is also being exploited on a pilot plant basis for the production of oil and its export. The reports received from the overseas users have been extremely encouraging. It is, therefore, suggested that the method for the extraction of oil from kuth roots, as developed by the National Chemical Laboratory, should be encouraged as widely as possible in view of the large potential for the export trade for this new produce from India. At the same time, costus resinoid which has a large demand in the perfumery trade should also be manufactured and exported.

(5) In order to have a high quality perfumery product which should receive increasing attention on the part of overseas perfumers, it is necessary that sound and scientific methods for collection of the roots and its drying, storage etc. should be introduced under expert advice. The age-old method of smoking the roots over any fuel (leaves, bark and other such wastes) is responsible for the poor quality of the

roots and introduces therein a 'burnt' odour which is difficult to remove from the end product. This has been responsible for a large scale refusal of the Indian costus roots, the oil and other related materials produced therefrom, in the international market. Proper drying methods require to be introduced to ensure good quality.

(6) The creation of a suitable machinery to undertake proper grading, quality control and marketing of the material is an urgent necessity.

(7) Distillation plants for the extraction of the oil, using improved techniques, should be encouraged in the private sector.

APPENDIX I

EXPORTS OF KUTH ROOTS FROM INDIA

Quantity : Metric Tons
Value : Rs. in lakhs.

Country	1961-62		1962-63		1963-64		1964-65		1965-66	
	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value
Hong Kong	10	0.37	9	0.32	1	0.03	78	1.31	233	5.71
China	76	2.77	-	-	-	-	-	-	-	-
Ceylon	-	-	2	0.06	-	-	-	-	6	0.11
France	-	-	-	-	-	-	7	0.18	29	0.80
Pakistan East	1	0.04	-	-	-	-	-	-	-	-
Afghanistan	-	-	-	-	-	-	-	-	14	1.39
Others	1	0.02	-	-	-	-	-	-	57	1.15
Total	88	3.20	11	0.38	1	0.03	85	1.49	339	9.16

Source: Monthly Statistics of the Foreign Trade of India.

CHAPTER VIII

KATHA OR CUTCH

Katha is a vegetable product derived from the heartwood of the tree Acacia catechu (willd.) locally known as Khair. The tree is deciduous and occurs throughout the greater part of the country except in the most humid regions. It is commonly associated with the forest types which occur on shingly or sandy alluvial beds of rivers and streams where it is markedly gregarious; and with the dry types of forests on high land away from water-courses, where it is frequently gregarious but is commonly mixed with other species characteristic of dry regions. It occurs on shallow stony soils and also on black cotton soils. In the Himalayas , the tree may be found in valleys at an elevation of about 1000 metres. The tree coppices well and therefore does not require replanting after felling. Older trees.i.e.,over 3 ft. girth. however, coppice poorly.

2. The wood is durable, heavy and hard. It takes a fine polish and is termite resistant. It is used for boat-making, cart construction, agricultural implements and for oil crushers. The sapwood is creamy white. The heartwood is dull pink which darkens to reddish-brown on exposure.

3. The heartwood is the source of Katha and is, therefore, commercially important. By boiling the heartwood, two important constituents are obtained, Katha and Cutch. Sometimes, a third product Kheersal is obtained which is in the form of a white powder or cystalline deposit in the cavities of the wood and occurs in small irregular fragments like bits of pale catechu and is readily purified by crystallisation from hot water. It fetches a high price and is used for medicinal purposes.

4. Katha is dull brown in colour but this varies with its purity. It is sold as irregular pieces or small square blocks of greyish-brown colour which on breaking show crystalline fracture. Katha is used extensively in 'pan' preparations and in medicine. It is an astringent. Recent research works in America have led to the conclusion that Katha is a rich source of vitamin 'P' which is said to strengthen the potency of human beings.

5. Cutch is marketed in the form of small cubes or blocks, rusty brown or dull orange in colour and of conchoidal fracture. It is used for industrial purposes. It is rich in tannin but its use in the preparation of leather has now been replaced by more suitable materials. It is a good preservative and dye giving a khaki or brown colour to the material. It is used in the textile industry as a dye and mordant. In preserving fishing nets, Cutch is considered second to none. It is also used to dye and preserve mail bags, sails, jute, textiles etc.

The proportion of tannin and catechin in Cutch is the prime factor which determines its character and value as a dye-stuff, tan and medicine. In Cutch the catechin content may be upto 17%.

Extraction

6. The extraction of Katha and Cutch in India has been carried on from very early times. In certain parts of the country there are particular communities or castes (Kathkaris or Khairwas) traditionally engaged in it. The major portion of production is still carried out in small batches.

7. The trees are regarded as suitable for Katha extraction when they are about a foot in diameter though in some parts of the country trees even 8" - 10" diameter are felled for this purpose. The important factor is the percentage of heartwood in the tree, and this varies not only with age but from locality to locality. The yield is dependent on the percentage of heartwood.

Country method of extraction

8. The country or "Handi" method of extraction is more common in the country and this method is usually employed near the Khair forest area leased for Katha manufacture. In this method, after felling, the trees are cut into logs of various lengths depending on whether transport is by human labour, carts or trucks. The bark and sapwood is generally chipped or axed off and if this is done near the site of Katha manufacture, this material is used as fuel together with spent chips and the wood of other species growing in the vicinity. The red heartwood is chipped into small pieces about an inch square in size near the site of manufacture. The chips are then boiled with an equal quantity of water in earthen pots till the mixture is reduced to about half the quantity of water. This requires about 6 hours. Sometimes the red extract is poured over fresh chips, boiled again and the process repeated till a decoction of suitable strength is obtained. This is further concentrated in earthen pots till it attains the consistency of a syrup. It is then poured into wooden frames lined with leaves and allowed to cool, when it hardens into a dark brown solid mass and is cut into suitable sizes and marketed. The boiling of the chips is generally done over a battery of fires and a refinement in recent years has been the use of aluminium or copper vessels instead of earthen pots. Iron vessels are not used as the tannin reacts with iron. The efficiency of extraction varies very considerably and the yield may be anywhere from 30 to 10% by weight of the wood.

9. For the manufacture of Katha, the concentrated extract is cooled and set aside for a few days for catchin to separate out. It is then poured into baskets placed over earthen pots or into moulds dug in fine sand. In the former case the tannin are drained into the pot and the crude Katha is left over in the basket. In the latter case, sand absorbs all the tannins and Katha is left over as a crystalline material.

10. Considerable economy and improvement in yield can be effected by converting the heartwood into fine shavings and the proportion of water reduced from 20% to 10% or even less and the extraction is complete in about half an hour. It is also necessary to avoid excessive heating to prevent the conversion of catechin to catechutannic acid. A further improvement is to strain the extract while still hot into another vessel through fine muslin. The filtered extract is concentrated till it is of suitable consistency. Concentration should not be carried too far as catechutannic acid retards the crystallisation of catechin in thick solutions. The decoction is allowed to cool slowly and seeded with some crystals of catechin and left to stand for several days. Sometimes it is necessary to reduce the temperature of the extract by immersing the vessel containing it in cold water. Katha crystals separate out and form a layer at the bottom.

The mother liquor is filtered through fine muslin and the Catechin collected is washed with some pure cold water to remove all traces of catechutannic acid. The pure material is collected and while partially moist, it is moulded into suitable forms and finally dried. This is very pure Katha. A second crop of Katha is obtained when the mother liquor is again concentrated and allowed to cool. This is removed as before the final mother liquor which is practically devoid of catechin is boiled down and made into Cutch in the usual manner. By this refinement in the country method the recovery of cutch which is an important industrial product and the extract of which is exported, is ensured. In the common country method the Cutch is lost.

Factory method of extraction

11. There are a few katha factories distributed in some of the States such as Gujarat, Maharashtra, Madhya Pradesh and Uttar Pradesh. The oldest and probably the largest of these is that run by M/s Indian Wood Products Ltd. at Izatnagar near Bareilly in Uttar Pradesh. Logs of Khair are brought from the forests where the sapwood, bark etc. had been removed / into small pieces. The chips are boiled in large copper boilers with hot water under slight pressure. The extract is concentrated in vacuum and cooled in refrigerated tanks, when Katha crystallises out. This is separated by filter presses and dried. To obtain Cutch the mother liquor is further concentrated in Kestner evaporators to such a consistency that it solidifies on cooling. The products of this factory are of a high quality.

12. In recent years, the production of Katha and Cutch by the factory method has been increasing but an inhibitory factor is the system of short term leases for the exploitation of Khair trees which does not ensure a regular supply of the wood to the factories. Factory owners who have to invest large sums of money in setting up their units are, therefore, averse to being so until they are ensured of a regular supply of Khair over a long period.

/ to the factory where mechanical run chips or disintegrators chip the wood

Production of Katha in the States

13. The gross area under Khair trees in the country is reported to be about 29 lakh hectares and the total current yield of Katha is about 40,000 tonnes. The important Katha producing States are Gujarat, Maharashtra, Madhya Pradesh, Uttar Pradesh, Orissa and Jammu & Kashmir.

14. Gujarat - In Gujarat State, the number of Khair trees is very limited. The available trees are, however, reserved for supply of the wood to the three katha factories in the State with which Government have entered into long-term commitments. About 10,000 to 12,000 Khair trees of 36" and over girth at breast height are supplied annually to these three factories, but this is inadequate and the factories operate at 75% of their installed capacity. The estimated production of Katha is about 250 tonnes annually.

15. Maharashtra - The exploitation of Khair trees is done on a commercial basis in the districts of Thana, Nasik, Dhulia, Chanda and Nagpur. Most of the Katha is produced by the country method in or near the Khair forests though there are a few factories in the State. Specially trained labourers known as 'Kathakaris' are engaged in the manufacture of Katha by the country method. Khair trees are sold to regular contractors by auction on short term leases. In Chanda district there is a long term lease in favour of the Katha factory at Manikgarh. The estimated production of Katha in the State is reported to be about 2,000 tonnes.

16. Madhya Pradesh - The Khair forests are distributed all over the State but particularly in the northern and eastern districts in the dry deciduous forests. Most of the production is by the country method and skilled labourers known as 'Khairwahas' are employed for this purpose. There is a Katha factory at Shivpuri, in which the annual production of Katha is 65 tonnes per year. This factory was established in 1945. The total production of Katha in the State is about 360 tonnes per annum.

17. Uttar Pradesh - In this State the Khair forests are chiefly confined to the fringes of the Bhabar belt and along the dry river beds in the sub-mountain region. The Khair trees are leased out generally on short leases and most of the production of Katha is by the country method in or near the leased area. There is a large Katha factory at Izatnagar near Bareilly, M/s Indian Wood Products Co. Ltd., which is the largest and one of the oldest Katha factories in the country. The annual production of Katha in this factory is about 400 tonnes and of Cutch about 900 tonnes. Recently some smaller factories have been set up nearer the Khair forests.

18. The total production of Katha in the State is about 1100 tonnes. The price of Katha is about Rs.13,500 per tonne (1964). Katha is also manufactured in Orissa, Bihar, Andhra Pradesh and Assam. Production figures for Orissa, Bihar, and Andhra Pradesh

are not available but in Assam the annual production is estimated to be about 75 quintals.

19. In view of the great importance of the Katha industry in the State, the State Forest Department plans to plant up an area of about 4600 hectares during the Fourth Five Year Plan and an equal area during the Fifth Five Year Plan. The annual sustained yield from these plantations would eventually be about 69,000 tonnes of heartwood or 3450 tonnes of Katha, yielding a revenue of about Rs. 460 lakhs annually, when these plantations are ready for harvesting.

20. Jammu & Kashmir - The occurrence of Khair trees is restricted to the tropical zone of the State which is comparatively limited in its extent. The tree occurs in pure patches in the dry alluvial beds of rivers and streams, particularly in the upper reaches of Ujh, Bhini, Devak and Basanter rivers clinging to and lending strength to the otherwise fast eroding banks. It also comes up in a mixture with other species characteristic of dry regions on the elevated foothills forming the Northern Tropical Dry Deciduous Forests in the areas adjoining Punjab.

21. Some attempts have been made by the State Forest Department to propagate the species and to extend its occurrence by raising plantations, but due to the greater demand for bamboos, the latter species is being planted more extensively in areas which are also suitable for Khair.

22. Annual contracts are given out by the State Forest Department for the manufacture of Katha from Khair trees in the demarcated forests. The exploitable girth is 2 ft. and over at which size the heartwood content is usually low. Trees on private lands are also felled and utilised by the owners for the manufacture of Katha after these are marked by the Forest Department in association with the State Revenue Department.

23. In the State, the manufacture of Katha is an important cottage industry. There are no factories and all the production is by the country method. It is estimated that the annual production of Katha in the State is about 60-70 tonnes.

Exports

24. The trade is largely in the hands of small manufacturers and dealers. Almost the entire quantity of Katha produced is consumed in the country but small quantities are exported to Pakistan and Africa. Cutch, on the other hand, is exported to some European countries, of which the United Kingdom is one of the important ones. Afghanistan and Pakistan also import Cutch. On an average, about 250 tonnes of Cutch valued at about Rs. 6 lakhs are exported annually from India (vide Appendix I).

25. The Indian Standards Institution have prepared standards for methods of sampling and testing for Katha, i.e., IS 2962-1964 Standard specification for Katha are under preparation.

RECOMMENDATIONS

(1) A complete survey of Khair bearing areas and an assessment of the existing potential should be carried out. It would entail the enumeration State-wise of Khair trees, both on forest and non-forest lands.

(2) On the basis of the above survey, a regular working scheme for the management of these Khair bearing forests should be prepared. This should include prescriptions for the scientific exploitation, regeneration and extension of Khair trees. The exploitation of Khair on non-forest lands should be controlled and restridted and exploitation of Khair in these areas should also vest with the State Forest Departments. The cooperation of the State Revenue Department and action at Government level will be required for this purpose. Planting stock should be supplied to Gram Panchayats and individuals at subsidized rates under the Farm Forestry Scheme.

(3) A major inhibitory factor in the manufacture of Katha and Cutch by the factory method is the lack of assurance of sustained and adequate supplies of Khair wood because of the policy of the State Governments to auction Khair trees on short leases. Unless there is an assurance of supplies of raw material on a long term basis there is an understandable hesitation on the part of private entrepreneurs to invest in Katha factories. Leases of 5 - 10 years are, therefore, recommended to encourage the establishment of new factories so that the production of Katha and particularly Cutch is increased.

(4) It was reported that some Katha traders are unable to take up large scale production of Katha by the factory method because of inadequate financial backing. It is, therefore, recommended that long term loans on easy conditions at low interest could be floated to encourage such private entrepreneurs.

(5) The country method of extracting Katha should be discouraged and the proper scientific method of extraction in factories encouraged because of the wastage of Cutch in the former. Cutch is a very important by-product of the factory method and has considerable export potential. The State Forest Departments should, therefore, take immediate action to encourage the setting up of Katha factories and gradually prohibit the manufacture of Katha by the country method.

(6) Research conducted at the Forest Research Institute, Dehra Dun, into various improvements which could be made in the country method should be brought to the notice of the contractors employing the country method. The improved methods recommended by the Forest Research Institute, Dehra Dun, would

also ensure a higher quality of Katha together with a recovery of some Cutch as by-product.

(7) The Indian Standards Institution may be requested to complete the preparation of standard specifications for Katha and Cutch on a priority basis.

APPENDIX I

EXPORTS OF CUTCH EXTRACTS FROM INDIA

Quantity : Tonnes
Value : Rs. in lakhs

Country	1961-62		1962-63		1963-64		1964-65		1965-66	
	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value
Afghanistan	56	1.78	2	0.23	20	0.61	9	0.99	27	0.78
Pakistan East	52	0.87	94	2.29	28	0.85	47	1.13	119	3.41
Pakistan West	28	2.47	53	2.13	96	2.47	210	5.17	87	1.63
Others	10	0.28	1	0.10	8	0.38	2	0.05	21	0.74
Total	146	5.40	150	4.80	152	4.31	268	7.34	254	6.56

Source : Monthly Statistics of the Foreign Trade of India

CHAPTER IX

AGARWOOD

The Agar (Aloe wood, calamanac eaglewood) of commerce is the aromatic wood of the tree Aquillaris agallocha Roxb. and belongs to the Botanical family Thymeleaceas. It is another important item which in the past had been produced in large quantities and was exported to the neighbouring Muslim countries. It is a tall, evergreen tree with tough and pliable bark, grey on the outside with a cork layer, light buff-coloured on the inner surface and with young silky shoots. Leaves are slightly leathery, flowers white in sessile or shortly stalked and silky umbels. Perianth is 0.65 cm. long, silky and densely hairy within. Fruit is velvety, 3-5 cm. long, obovoid, slightly leathery.

Distribution

2. The tree is a native of Nagaland, Manipur, NEFA, the Khasi and Garo Hills of Assam and Tripura. It is also found in Malaya and East Pakistan. Indian Agarwood is of the best quality and enjoys a monopoly in the world market. The areas where these trees are concentrated need to be preserved.

Uses

3. Agarwood is used not only as an incense in the manufacture of incense sticks, but also for the production of very expensive Indian attars which are in great demand in neighbouring countries.

4. Agar is used as an incense by the Parsees and Arabs. The wood is white to pale yellowish-white or light brownish - grey and highly scented. The trunks of the large trees are used for making dugouts, the Karens of Burma making bows out of the light-coloured wood.

5. Commercially important Agarwood contains an oleo-resinous matter due to infection by a fungus and is in great demand. The infected wood is distinguished by the presence of innumerable coarse, dark coloured, irregular masses; the parts of the wood which contain these resinous patches are also protected from decay and last as long as any durable timber. The resin-impregnated wood is used for distilling the highly scented oil, known as agar attar, which is very greatly prized in the East as a perfume. In oriental countries this resinous wood is used as an incense. In China 'Joss-sticks' are made out of it. In India and Pakistan, it forms an important ingredient in the manufacture of 'agar-batti' or 'agar' lights and in mixtures used for embalming the dead. The wood is an insect repellent and its powder is, therefore, used as a preventive against fleas and lice on skin and clothes.

6. In Malaya, the aromatic wood is used as a cosmetic. It is also used by cabinet makers and for beads, rosary, crucifixes, small jewel cases, ornaments etc.

7. The bark yields a natural paper, and is used as such by the tribals of Assam. Many sacred books have been written on its bark. It is also used for covers of unbound books. A fibre which is long, white, silky and very strong is extracted from the bark. Strips of the bark are used by the hill tribes for making ropes.

8. Agar oil which is obtained by water distillation of Agar wood, is prized in the perfumery industry as a fixative and for its balsamic woody odour.

Infection of trees

9. The natural infection of fungus which results in the accelerated process of Oleo-resin formation is a slow process. Therefore, suitable techniques of artificial infection need to be evolved to accelerate the process of oleo-resin formation in the trees. Such a research programme should be taken up by the Forest Research Institute and Colleges, Dehra Dun.

Collection of Agar Wood

10. The State Forest Departments auction the trees which yield the Agarwood.

There is yet no scientific basis to determine whether any particular tree can yield the oil-containing wood but generally diseased trees are felled and search for the Agarwood is made by the collectors. Some of the indications for the presence of the oleo-resin are (i) the diseased condition of the tree as indicated by a poor crown, decayed branches and uneven bole, particularly at 3 to 7 metres height; (ii) swellings or depressions and cankers on the bole; and (iii) the appearance of hordes of ants in the fissures on the bole. Further, the wood assumes a distinctly yellowish tinge when agar formation takes place, while the normal wood in the healthy tree is of a pale cream-buff colour. The colour change can be noticed by peeling off the bark.

11. There is no definite information available regarding the relationship between the age of the tree and the accumulation of agar on it. According to Rao and Bhatia (Indian Forester 1958, 85(1) : 51-55) usually about 80-years old trees are felled for the collection of agar. At this age the tree is about 5 to 8 feet in girth and 70 to 100 feet in height. Hooper (Agric. Ledger, 1904, 11 :1) states that agar is frequently found in trees about 20 years old but the development takes time and trees about 50 years old have the highest concentration.

12. The search for the agar deposits is done by chopping off the bark and the wood of the felled trees until the dark-coloured veins are met with, indicating the proximity of the valuable Agar wood which generally extends to a short distance from the centre of the trunk or branch. In this manner, the whole tree is investigated and it is reported that about 6 to 8 lbs. of Agar wood is obtained from a mature tree (Hooper, Loc. cit.), Gulati (Survey of Indian Essential Oils, Leaflets No.1 "Agarwood Oil", C.S.I.R. New Delhi, 1959) states that before felling a tree, two small holes are made in the trunk at a distance of one foot. The presence of dark-coloured wood is an indication of the presence of agar. The tree is felled on finding this indication. It is, however, doubtful if this commendable practice is actually widely prevalent. Employment of unskilled labourers results in indiscriminate felling of trees resulting in loss of trees which might have otherwise developed agar at a later stage.

Production

13. The average annual production of Agar wood in Assam is reported to be about 75 tonnes. Plantations of Agarwood trees exist only in limited forest areas in Assam. For some years after the partition of the country, regular smuggling was going on between East Pakistan and Assam whereby real Agar wood was lost without much benefit to India's trade.

Grades

14. Depending upon the extent of accumulation of the oleo-resin, the heartwood is graded into four qualities, (i) Agar or Black agar - This is the richest in oil content, is black in colour and heavier than water, (ii) Bangtang - This is brown in shade and has almost the same density as water, (iii) Bhutta - also known as Phutas or Kalaguchi - It is also brown in colour but is interspersed with 50 per cent or more of yellow-coloured wood. It floats clear on water, (iv) Dhoom- This is the lowest grade and is mostly yellow with streaks of brown and black oleoresin here and there.

Sometimes the sap wood also developed an aroma, and such wood is calledOlagasi. It is not distilled but is used as a cheap incense.

Price of Wood

15. The wood is priced according to the grades mentioned above. During 1963-64, the price per tonne ranged from Rs.9179 to Rs.37,600 (Monthly Statistics of the Foreign Trade of India)

Export Trade

16. Agarwood (usually the first three grades) is exported chiefly to Arabian countries. The quantities exported during 1961-62 to 1965-66 varied from 3 to 111 tonnes. The leading importing countries are Aman, Kuwait, Bahrein Islands and

Aden. The quantities and values of Agarwood exported (country-wise) from India during the period 1961-62 to 1965-66 are given in Appendix I.

Agarwood Oil

17. As a result of the investigations carried out at the Forest Research Institute, Dehra Dun, the most economic method for the recovery of the pure oil of Agarwood is now known. In Assam, the oil is obtained by the water distillation of chipped Agarwood in indigenous type of stills. Generally, the yield of oil is reported to vary from 0.25 to 0.38 per cent.

18. The quantity of Agarwood available for distillation is reported to be about 31 tonnes which would yield about 77.5 kg. of the oil (Gulati, Loc. cit.).

19. Fairly large quantities of the oil have been produced according to the F.R.I. method by some of the distillers also and world-wide interest in the pure oil of Agarwood has already been created. Plantations of Agarwood need to be given a priority.

RECOMMENDATIONS

(1) For increasing the production of Agarwood, artificial insulation technique to accelerate the rate of oleoresin formation needs to be evolved. University of Gauhati has already started work in this direction and this work should also be taken up by the Forest Research Institute, Dehra Dun. The mode of infection, the casual agent and other relevant information in this field is also necessary to be collected.

(2) Steps are necessary to be taken to evolve suitable methods for distillation to increase the yield. Intensive research work in this aspect needs to be taken up by the Forest Research Institute, Dehra Dun.

(3) A Pilot Plant to extract oil which will have a ready market is necessary to be set up to explore market possibilities of ready-made oil.

(4) Strict measures for quality control in order to promote export trade is necessary.

(5) Instead of the wood, the exporters should be encouraged to export oil extracts which will have a wider market.

(6) Protection of plantations and natural forests containing this species is necessary to preserve this important tree which constitute substantially in earning foreign exchange for India.

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APPENDIX I

EXPORTS OF AGARWOOD FROM INDIA

Quantity : Metric Tons
Value : Rs. in lakhs.

Country	1961-62		1962-63		1963-64		1964-65		1965-66	
	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value	Qty.	Value
Aden ...	Neg.	0.17	-	-	1	0.38	19	0.21	24	0.23
Bahrein Island	Neg.	0.03	-	-	-	-	Neg.	0.01	6	0.04
Kuwait ...	Neg.	0.75	Neg.	0.17	1	0.23	10	0.53	39	0.63
Trucial Oman	3	0.43	2	0.68	Neg	0.28	9	0.21	24	0.34
Pakistan ...	Neg.	0.04	1	0.17	3	0.27	-	-	3	0.04
Sweden ...	-	-	-	-	Neg.	0.02	-	-	-	-
Saudi Arabia	-	-	-	-	Neg.	0.08	Neg.	Neg.	-	-
Zanzibar ...	Neg.	0.01	Neg.	0.01	-	-	-	-	-	-
Others ...	Neg.	0.06	-	-	-	-	9	0.33	15	0.14
Total	3	1.49	3	1.03	5	1.26	47	1.29	111	1.42

Neg: Negligible

Source: "Monthly Statistics of the Foreign Trade of India".

CHAPTER X

ROSIN AND TURPENTINE

The main sources for the manufacture of turpentine and rosin in India has been the resin from Chir pine which is abundantly available in the forests of Uttar Pradesh, Himachal Pradesh and Jammu & Kashmir. India is one of the major Rosin and Turpentine producing countries in the Commonwealth.

2. Rosin and Turpentine are starting materials for many industrial products. Commercial exploitation of the resin of the Chir pine serves a wide range of industries. Resin is used in the manufacture of shellac, varnishes, soap, paper, oil cloth, linoleum, sealing wax, printing inks, electric insulation, gramophone records and wheel greases. It is also a source of turpentine which is the chief thinner and solvent employed in the paint and varnish trade, in boot polishes, medicines, pine oil and is also used in the manufacture of synthetic camphor. Pinus roxburghii (Pinus longifolia), Pinus wallichiana (Pinus excelsa) and Pinus Khasya (Pinus insularis) are amongst the important Indian Pines which can be tapped for the recovery of oleo-resin. Of these Pinus roxburghii is the only species which is being tapped for the oleo-resin, because of the comparatively lower altitude, congenial climatic conditions and easy accessibility of the area where it grows as well as the high out-turn of resin.

3. Pines grow at an elevation of 700 to 3000 metres on the Himalayas and Shiwalik ranges and also in the valleys of the major Himalayan rivers. They are found from Bhutan in the east to Afghanistan in the west and also in the Khasi and Jainti Hills in the Mizo Hills and in Nagaland and Manipur. Pines (Pinus insularis) have been successfully cultivated in Kodaikanal Hills in Madras State.

4. Rosin and Turpentine can be manufactured by distillation of oleo-resins collected from Pine trees. Rosin and Turpentine manufactures are divided into those that process the oleo-resin, on a cottage scale and those that have large well organised units. These large scale units are in operation in almost all the States where Chir pine occurs. They are working in close collaboration with the State Forest Departments and enjoy almost a monopoly right of processing the resin produced in the State forests. In addition, a number of cottage scale producers also flourish in the States of Himachal Pradesh and Punjab and they are also in a position to get a part of the resin supplied to them by the State Forest Departments. A few medium scale units also have been organised in Uttar Pradesh. Such a unit had also been set up in Assam under State control. It started the distillation of the resin from Pinus Khasya which gives a turpentine oil of a much higher pinene content and rosin of higher grade. Unfortunately this unit had to stop functioning after working

for a few years because of poor yield from the trees as a result of high rainfall in the area.

5. Resin from high altitude pines and specially from Pinus excelsa in Jammu & Kashmir State gives a much higher quality of pinene and rosin, but supplies are restricted due to the inaccessibility of the forest areas abundant with these pines and the sporadic nature of the species which occurs in pure crops only in limited areas in the Kashmir Valley. Consequently utilization of these pines has not yet become practical.

6. The pattern of the pine resin distillation industry in the country has, of late, undergone a revolutionary change. From a position of an unsaleable surplus of the turpentine oil and a heavy demand for Rosin, it has now changed over to the position of leaving an unsaleable surplus of Rosin with no surplus turpentine oil being available whatsoever. The main reason for this change in the industry has been that the oil of turpentine has now been considerdd to be an important basic material for the production of a number of chemicals, such as synthetic camphor, oil of pine and valuable perfumery chemicals, namely citral, geranium, linaloe etc. Large scale units for the manu facture of synthetic camphor and oil of Pine have already been organised in Bareilly (Uttar Pradesh) and Hoshiarpur (Punjab). With this development there is no surplus of the oil today unless more resin is available from the forests. Obviously, the use of oil of turpentine as a raw material in the chemical industry and its export in the form of finished chemical products will result in earning more foreign exchange for India.

7. The programme for the disposal of Rosin requires urgent attention as its use by the soap, paper and the paint industries is now being done away with, because of unreasonably high prices. This is a serious problem as ultimately the undisposed Rosin will have its own adverse effects on the price structure of the oil of turpentine which will have to be raised unduly. The demand for Rosin by the soap, paper, paint industries etc. is very heavy and it will go on increasing with greater development in these fields. Planned efforts need to be put in for examining the economics of the industry in such a manner that utilisation of the oil of turpentine as a raw material for the chemical industry goes on enjoying its new important role without serious dislocation and at the same time Rosin would be welcome by the various user industries either as such or in the modified forms in which it should be produced in future.

8. Another problem which is responsible for serious losses in quality of both the oil and Rosin has been the extremely negligent handling of the crude resin from the forest areas and its transport in old tins which bring about contamination with iron and adulteration with extraneous matters during transit from one stage to another. The quality of the oil and Rosin could be greatly improved if handling of the resin, transport, packing etc. are controlled effectively.

9. Another important material which requires to be explored from the economic point of view is the production of the pine oil from pine needles and conversion of the exhausted needles into pine wool which will be of importance as a packing material. Pine tar from the stump of the pine trees is another item which can be obtained from the stumps of the pine trees which are left in the ground after the trees have been felled in the forest areas. Production of the pine tar was attempted during World War II when supplies from the Scandinavian pine tar producers were altogether cut off. Large quantities of pine tar are required by the rubber industry and also for preservation of marine ropes, fishing nets etc. Indigenous production of pine tar was stopped due to re-introduction of imported material from abroad. It has now been revived again. Every effort should be made in a planned manner to raise the status of this industry as it supplies pine tar to the rubber industry which has an important strategic position in our national defence. Large quantities of pine tar, adequate to meet the indigenous demand, can be produced from the stumps which are left over without being extracted in the forest areas. This question needs to be examined carefully before the industry can take up this work. A major handicap in this is the fear that the removal of the stumps would cause erosion as the stumps serve to hold the soil on steep slopes.

10. One of the latest and most promising economic developments in the field of turpentine chemistry has been the utilisation of the high boiling sesquiterpene fractions of longifolene and carenes from the oil of turpentine as important and costly perfumery chemicals, such as jasmine, jasminal, etc. can be obtained from the oil. Pioneer work in this regard has been done at the National Chemical Laboratory and also by a few entreprenuers in the private sector. Its utilisation on a commercial scale has already commenced. This aspect needs further intensive attention on the part of research and development organisations.

The present status of the industry in different States is given below:

Jammu & Kashmir

11. In Jammu & Kashmir State, where the resin industry is a flourishing one, the raw material is the oleo-resin collected from Chir pine, Pinus roxburghii which is predominent at the lower altitudes of the State varying in range from 457 to 1097 metres with its best growth at altitudes of 760 to 1097 metres. Chir occurs over an area of about 1600 sq. miles of the exploitable forests in the State. The following statement shows the extent of occurrence, division-wise:-

Name of Division	Commercial area (km^2)
1. Kishtwar (Jammu Province)	-
2. Bhadarwah	... 17.09
3. Doda	... 2.77
4. Ramban	... 129.84
5. Reasi	... 221.96
6. Udhampur	... 216.24
7. Rajouri	... 653.17
8. Billawar	... 212.86
9. Jammu S.C.	... 128.20
(Kashmir Province)	
10. All Divisions ...	... Nil
Total	1598.13

12. Resin tapping of Chir (Pinus roxburghii) for commercial purposes was initiated in Jammu & Kashmir State about five decades ago and is well established now. Various techniques were employed. The light continuous tapping method has been evolved and is now in vogue. It is a safe method and does not kill the tree as apprehended in some of the earlier techniques. The prescriptions laid down under the technique conform to the standard Indian practice and are well suited, and should be strictly followed in actual practice.

13. Prior to the disturbances of 1947 in this State, the level of production had reached about 22,222 to 25,926 quintals per annum. After that, owing to the loss of important resin producing areas of the erstwhile Mirpur Division and the disturbed conditions in other Chir bearing areas near the ceasefire line, such as Rajouri and Poonch, the annual production fell to about 7404 quintals.

14. The production has now shot up to around 30,000 quintals per annum. The enhanced production is due mainly to the opening up of Chir bearing tract in the Siwalik hills by roads and due to increased wages to tappers since 1959.

15. With the restoration of normalcy in the Chir bearing areas of the border regions in Poonch and Rajouri Divisions, opening up of hitherto untapped areas and further extension of areas under tapping, coupled with intensification and improvement of the tapping industry at all levels, it is hoped to increase the yield and step up the production of the Chir Oleo-resin to about 45,000 quintals per annum.

Processing

16. There is a Resin & Turpentine Factory in Jammu & Kashmir State at Miransahib set up in 1939-40 as an independent Government concern. The factory was recently been taken over by Jammu & Kashmir Industries Ltd. which is an autonomous board for State Industries.

17. Processing of Chir pine oleo-resin is carried out at the factory under the continuous fractional distillation process. The factory distills about 2,000 to 2,600 tonnes of oleo-resin annually. Its processing capacity requires to be enhanced to at least 3,704 tonnes, so as to utilize the existing surplus collection which runs to about 370 tonnes per annum and also to cope with the increased production as envisaged for future expansion.

Employment

18. About 3-4 thousand families are employed in tapping operations in the forest. The factory affords employment to 150 workers who earn good wages and bonuses.

Economics

19. The bulk supply of the resin collected in the State goes to the Rosin & Turpentine Factory at Miransahib in Jammu Province. The total cost of resin delivered at the factory site works out to Rs.45/- per quintal as against Rs. 27/- to Rs.30/- per quintal about a decade back.

20. During the previous 5 years, the price of resin realised from the factory has risen from Rs.62/- in 1961-62 to Rs.73/- per quintal in 1964-65. On the other hand the sale value of the surplus production in the open market during the corresponding period varied from Rs.89/- in 1962-63 to Rs.94/- per quintal in 1964-65. The revenue from resin tapping, at the present tempo and the prevailing rates, runs to about Rs.25.0 lakhs per annum as against an expenditure of about Rs.9.0 lakhs only.

21. The Rosin & Turpentine Factory was started with a rotating capital of Rs.3.0 lakhs and upto 1957-58, it has yielded Rs.24,86,302/- as net profits besides Rs.2,40,000/- paid as interest to the State Exchequer. The State Forest Department shares in the profits of the factory on 50 : 50 basis.

22. As regards export of Rosin and Turpentine, it may be stated that the export rates are very low (about 50% less) than the current market rates prevailing in the country and unless the Government subsidises the commercial unit, it is not possible to export Rosin and Turpentine.

Himachal Pradesh

23. There is at present only one Rosin & Turpentine Factory situated at Nahan, in Sirmur District, Himachal Pradesh, which is under the administrative control of the State Forest Deptt: It produces annually 25,000 to 27,000 quintals of Rosin of various grades and 6,25,000 to 6,85,000 litres of turpentine oil, both of ISI specification. Another factory for the manufacture of Rosin and Turpentine is being set up in the

public sector, at Bilaspur (Himachal Pradesh). This factory will have an installed capacity for processing about 74,600 quintals of resin and for the production of 46,800 quintals of rosin of various grades and 16 lakh litres of turpentine oil. It will also produce other subsidiary products lik phenyle, varnish etc. The products manufactured in the factory are sold in this country. But now it has been experienced that the trend of market of Rosin and Turpentine of various grades in our country is unfavourable and as such the factory is facing difficulty in disposal of Rosin and Turpentine. In order to dispose of the stock and earn foreign exchange for the country, it is considered that WW and some quantity of WG grades of Rosin of ISI specification should be exported to foreign countries.

24. The State Trading Corporation and other recognized export houses have been requested to seek overseas market for Rosin produced in the afore-mentioned factory. A major factor inhibiting exports is the appreciable disparity between the rates in the indigenous markets and those prevailing in the overseas ones. Government of India had earlier announced that 40% entitlement of the total value of export of Rosin would be allowed to the exporter for the purpose of importing chemicals etc. from the overseas markets. This relaxation or facility will certainly meet a part of the gap in the prices but will perhaps not cover the total loss.

Uttar Pradesh.

25. The production of oleo-resin in this State in 1966-67 was about 2,50,000 quintals (25,000 tonnes). This resin is obtained from the Chir pine (Pinus roxburghii) which grows in pure crops in the outer ranges of the Himalayas from about 900 m. to 1500 m. altitude. The best pine crops occur at 1100 to 1500 m. in the inner valleys of the important rivers. The trees are tapped according to diameter sizes and the collection of the resin is well organised.

Most of the resin collected in the state forests is utilised by the factory at Clutterbuckganj near Bareilly, the Indian Turpentine and Rosin Factory Ltd., which was at one time a private owned factory but is now in the public sector. The factory processed about 11,000 to 15,000 tonnes of resin annually and produces about 9,500 tonnes of Rosin and 2300 kilo litres of the Turpentine oil. In recent years the factory has built up an export market through the State Trading Corporation. It can export about 3500 tonnes of Rosin and about 1500 tonnes of Turpentine annually.

26. Data covering actual collection of oleo-resin from Forest Departments for the year 1965 and 1966 are given below:

	Quantities of Oleo-resin collected during 1965 (in tonnes)	1966
Uttar Pradesh	23,673	25,924
Himachal Pradesh	10,036	16,100
Punjab	6,272	-
Jammu & Kashmir	3,047	2,735
	43,028	44,759

27. The manufacture of Rosin and Turpentine is now a well established industry in the country. There are at present three units in the organised sector. Their capacities are as follows:-

Capacity in terms of Oleo-resin processed in 1966-67

(a) Indian Turpentine and Rosin Company Ltd., Bareilly. 135,000 quintals

(b) Himachal Government Rosin & Turpentine Factory, Nahan. 34,270 "

(c) Government Rosin & Turpentine Factory, Miransahib, Jammu & Kashmir, Jammu, Tawi. 22,750 "

The market price of rosin is about Rs.90 per quintal.

28. Besides the above, there is a factory in the public sector coming up at Bilaspur in Himachal Pradesh while there are about 22 to 28 small scale units, mainly in the Punjab and Uttar Pradesh. The technique adopted by the small scale units is crude and is adversely affecting the quality of their products. The actual output of Rosin and Turpentine during the last 5 years by the units in the organised sector has been as follows:-

Year	Rosin (Tonnes)	Turpentine (Kilo litres)
1962-63	13,838	3,418
1963-64	12,557	3,412
1964-65	12,284	3,354
1965-66	14,575	3,708
1966-67	14,461	3,857

In the case of rosin the recovery percentage is about 75% while for the oil it is about 17%.

29. The output of the units in the small scale sector is not known though every attempt was made to collect this information. However, from data informally gathered, it is expected to be more or less of the same order as that of the units in the organised sector. Turpentine oil, the yield of which is about 1/4th of that of Rosin was until recently

considered a liability as uses for this material had not developed. Recent developments in this field, namely, the establishment of units for the manufacture of Camphor, Synthetic pine oil and aromatic chemicals have resulted in a shortage of the gum spirit of Turpentine. As stated earlier, entrepreneurs in this field have been exploring possibilities of tapping pine resources within the country and in the adjoining countries, so as to meet their increasing demands for turpentine oil. This would also indicate that at present we are not in a position to export Gum spirit of turpentine.

30. Rosin, which at one stage was in great demand and necessitated the issue of licences for its import though on a restricted scale, is now available in plenty. This, however, does not mean that the present production is surplus to our requirement. The present output is just adequate to meet internal demands for paper, soap, surface coating and a large number of other smaller industries. But some of the consuming industries have been forced to partially switch over to the use of substitutes due to the increase in the price of Rosin, which has risen by nearly 50% during last few years. Our prices are far too high when compared with the prices prevailing in the international market. One of the major producers of this commodity had recently brought to the notice of Government that Rosin is available in the international market at almost the same price at which they buy oleo-resin from the State Forest Department. From the data furnished in this connection, it is seen that while the forest department was earlier selling oleo-resin at Rs.80/- to Rs.95/-per quintal, the present price is about Rs.100/- per quintal. This has resulted in the accumulation of large stocks of Rosin with producers. One of the units in the organised sector alone held recently over 4,000 tonnes of this material. Incentive licences to the extent of 15% which is the maximum permissible, are under consideration to boost the export of Rosin. But this is perhaps inadequate to liquidate the accumulated stocks. The only solution in this regard may be reduction in the selling price of the oleo-resin. It is further understood that there are a few bottlenecks, e.g., the high cost of packing oleo-resin, deterioration in the quality of resin due to defective packing and the high cost of transport, which are adding to the sale price of oleo-resin. Economy in these factors need to be considered in order to reduce the cost of the raw material.

31. There is considerable demand in the overseas market for Rosin and Turpentine. The main impediment standing in the way of exporting Rosin and Turpentine oil is the comparatively low prices in the foreign market of these commodities. In short, the manufacturing concern lose about 25% of the cost of production of these commodities. During 1966-67 about 2,000 tonnes of Rosin and 1000 tonnes of Turpentine was exported to various countries. Even during June 1967, nearly one thousand tonnes of turpentine oil has been exported to Hungary. Therefore,

it is evident, that this is a source by which the country can earn valuable foreign exchange if some arrangement can be evolved to compensate the manufacturers against the loss involved. About Rs.35,00,000 of foreign exchange has been earned by these sales through State Trading Corporation during 1966-67.

32. If about 25% of the production is exported it will help to stabilise the industries. While considering the various ways for boosting the export, it was expressed that the export may be subsidized directly by the Government of India. Concession in railway freight on the commodity exported should also be allowed. The following quantity of Rosin and Turpentine is available for export:-

Rosin	...	7,000 tonnes
Turpentine	...	2,500 "

Against the above quantity, current export is as follows:-

Rosin	...	2,000 tonnes
Turpentine	...	1,000 "

33. It was emphasised that research to find new uses of resin and its products should be intensified under a coordinated programme by the industry and Forest Research Institute, Dehra Dun, so that even in the event of competition of synthetic products the industry can stand on its own. In Japan and other countries resin is being utilised in the production of linoleum, plastic industry, adhesives and high quality paint, etc. Similar avenue of utilisation in this country should be explored.

RECOMMENDATIONS

(1) Concerted efforts should be made to increase the production of resin from the forest areas in the Himalayas.

(2) Arrangements should be made for the proper handling of resin from the source to the delivery point. Contamination from storage tins and adulteration from extraneous matters during transit should be minimized. In order to purify it from iron contamination, oxalic acid is used but this changes the composition of resin. It would, therefore, be desirable to prevent the contamination itself by using good quality containers.

(3) The export of Turpentine should be restricted so as to encourage its utilisation in indigenous industries. This will result in saving the foreign exchange now being utilised on imports.

(4) The overseas markets require various grades of Rosin. It is not enough to supply them with only WW or WS grades. There is a demand for N grade and it might even be possible to find some demand for B & D grades. Efforts should be made to meet all these demands. 70% of the total production of WG and 40% of N grades produced should be reserved for export.

(5) Uniformity in quality should be maintained for all grades and the Indian Standards Institution should standardise these grades.

(6) Pine oil can be extracted from the needles of the pine trees and the exhausted material can be turned into pine wool which is a very good shock absorber and is used as a packing material. The utilisation of the high boiling sesquiterpene fractions of longifolene and carenes from the oil of turpentine is important and costly perfumery chemicals such as jasmine, jasminal etc. can be produced from this. Some work on this aspect has been done in the National Chemical Laboratories but it is yet to be started on a commercial scale. Research and development of this industry has to be intensified at National Chemical Laboratory and in the Private Sector.

(7). To encourage exports:-

i) Rosin and Turpentine should be brought under the schedule of items eligible for subsidies for exports by Commerce Ministry;

ii) Railway Ministry should be approached to allow 50% concession in railway freight on the quantities that are moved for export; and

iii) that a special quota of bright tin plates should be made available to the Industry to reduce the cost of production of Rosin.